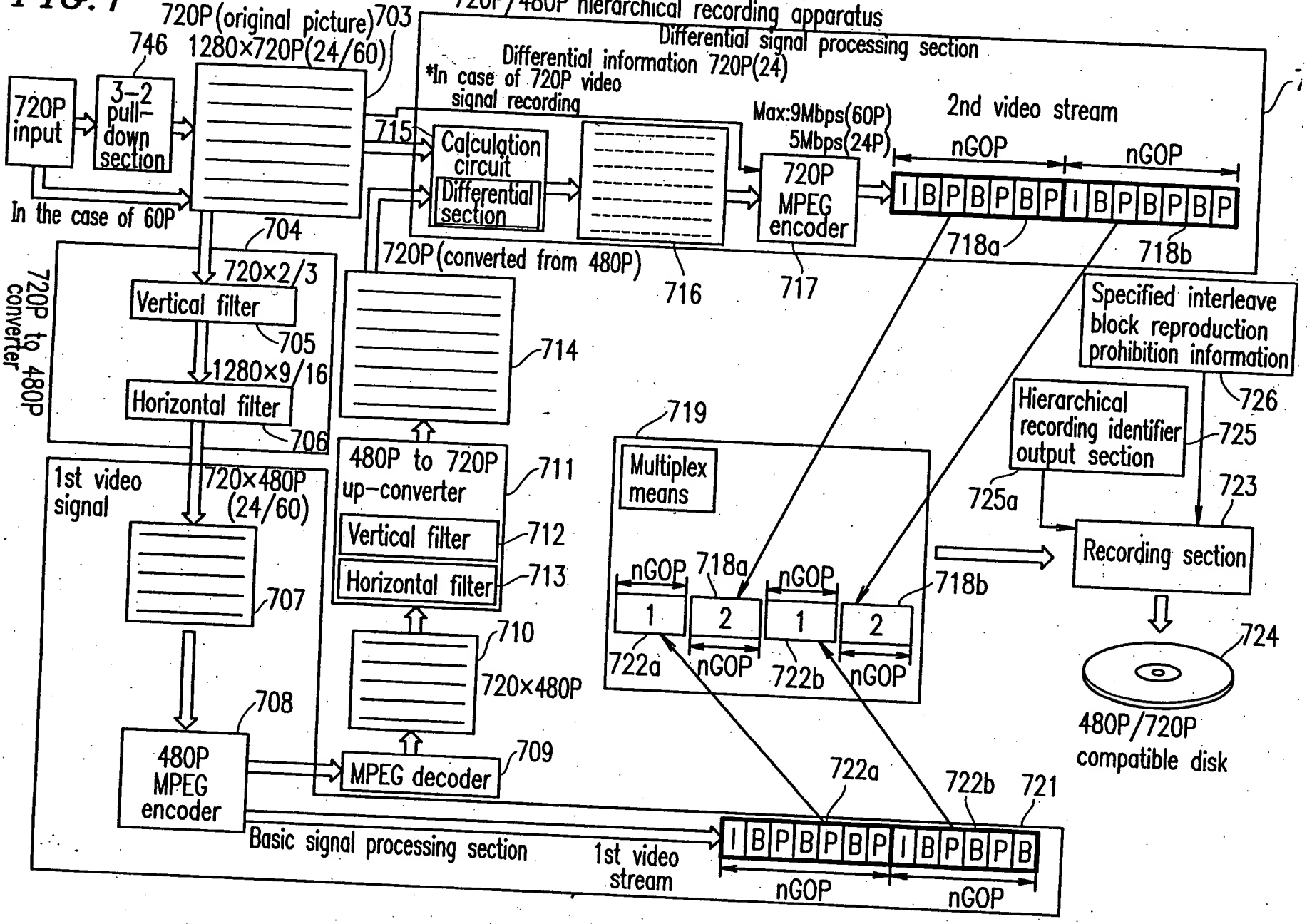
FIG. 1



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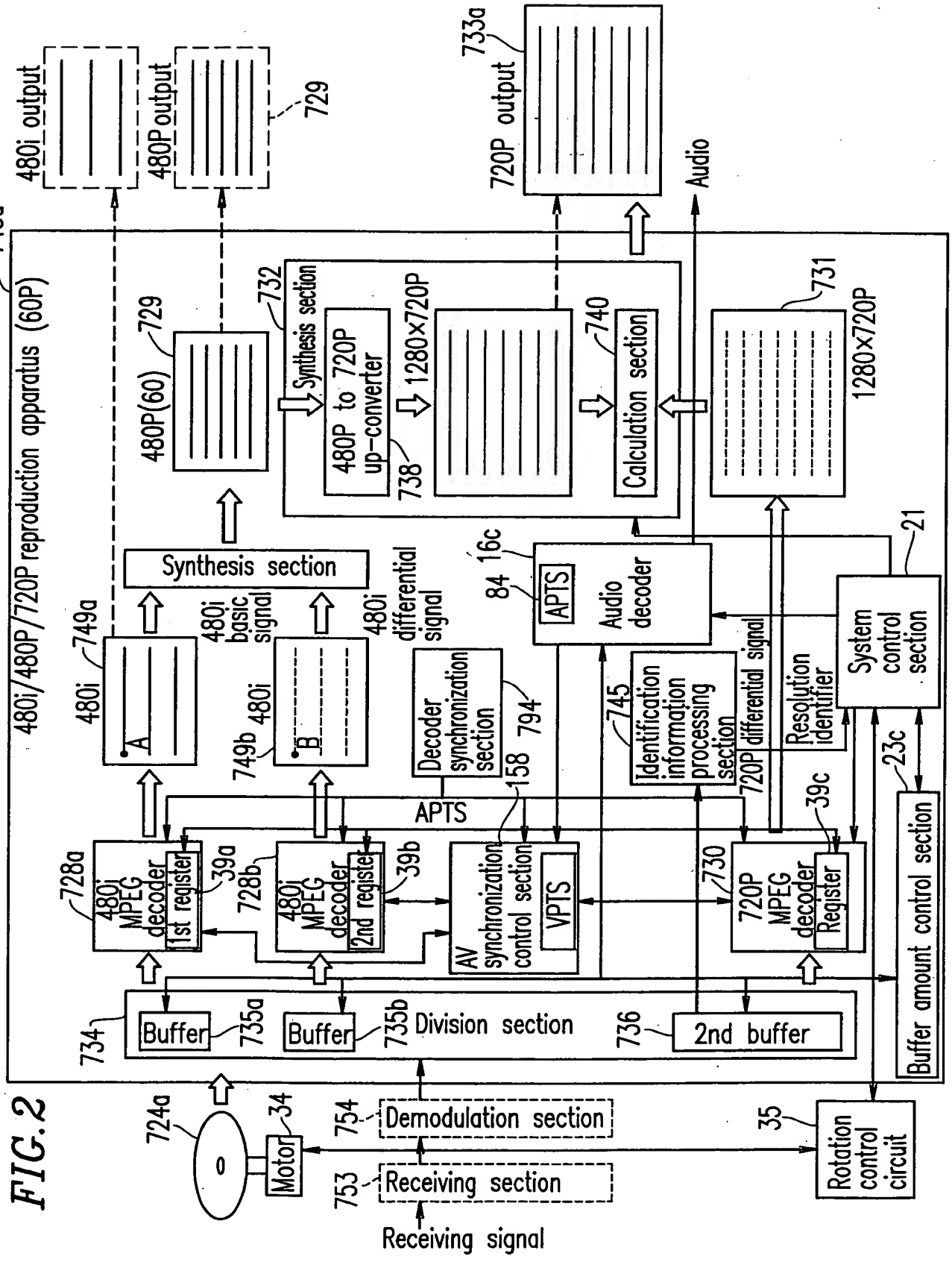
743a
480i/480P/720P reproduction apparatus (60P)
480i output
480P output
729
733a
720P output
Audio
480P(60)
729
732
Synthesis section
480P to 720P up-converter
738
1280×720P
740
Calculation section
731
1280×720P
Synthesis section
480i basic signal
480i differential signal
16c
84
APTS
Audio decoder
21
749a
480i
A
749b
480i
B
Decoder synchronization section
794
745
Identification information processing section
720P differential signal
Resolution identifier
System control section
APTS
158
39c
23c
728a
480i MPEG decoder
1st register
39a
728b
480i MPEG decoder
2nd register
39b
AV synchronization control section
VPTS
730
720P MPEG decoder
Register
Buffer amount control section
734
Buffer
735a
Buffer
735b
Division section
736
2nd buffer
724a
34
Motor
754
Demodulation section
753
Receiving section
Receiving signal
35
Rotation control circuit

FIG.2

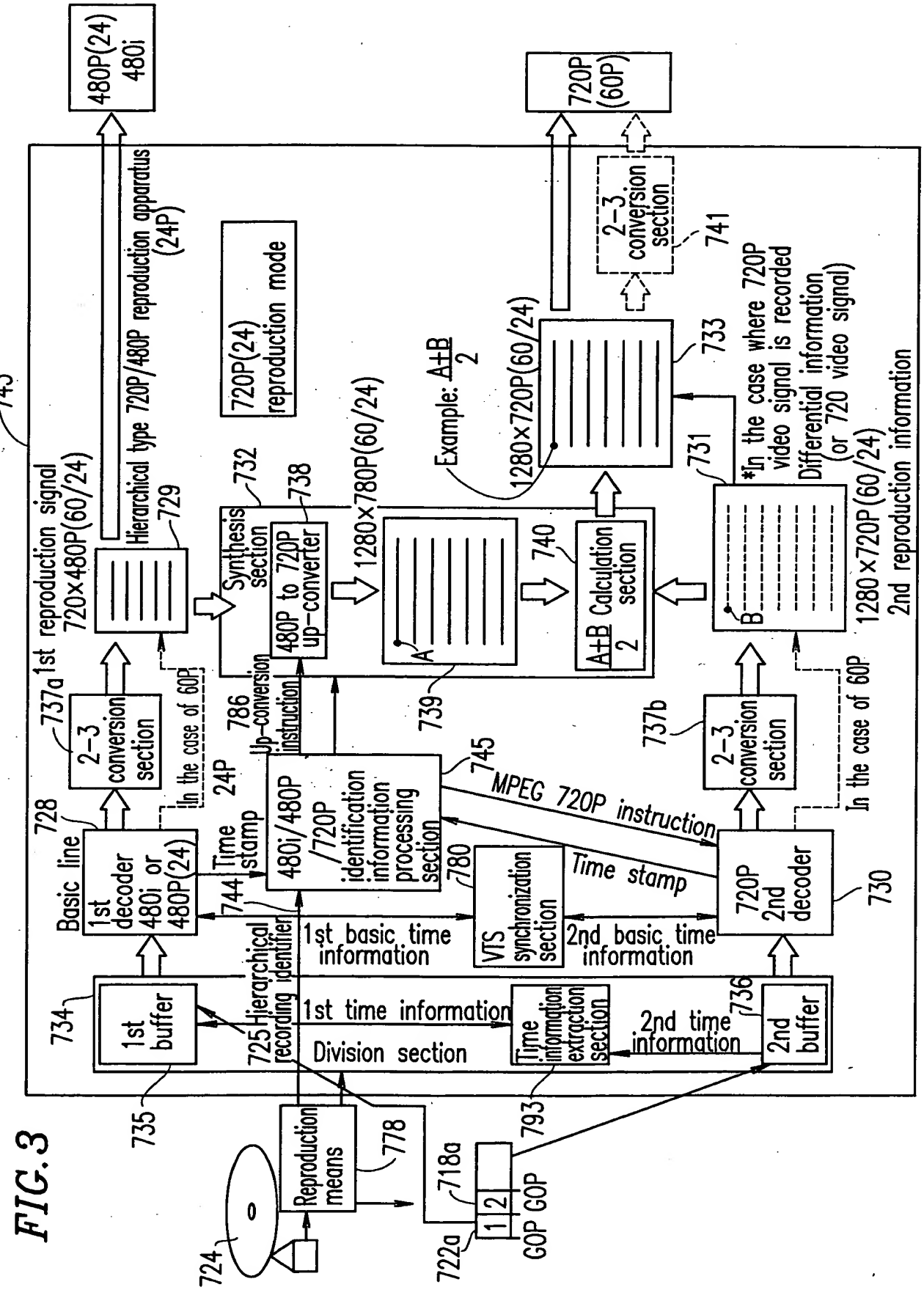
480P(24)
480i
720P
(60P)
743
Hierarchical type 720P/480P reproduction apparatus
(24P)
720P(24)
reproduction mode
2-3
conversion
section
741
1st reproduction signal
720×480P(60/24)
729
732
Synthesis
section
738
480P to 720P
up-converter
1280×780P(60/24)
Example: A+B
2
1280×720P(60/24)
733
731
*In the case where 720P
video signal is recorded
Differential information
(or 720 video signal)
1280×720P(60/24)
2nd reproduction information
737a
2-3
conversion
section
In the case of 60P
786
Up-conversion
instruction
739
740
A+B
2
Calculation
section
B
737b
2-3
conversion
section
In the case of 60P
728
Basic line
1st
decoder
480i or
480P(24)
24P
Time
stamp
744
480i/480P
/720P
identification
information
processing
section
745
MPEG 720P instruction
780
VTS
synchronization
section
Time stamp
720P
2nd
decoder
730
Hierarchical
recording identifier
725
1st basic time
information
2nd basic time
information
734
1st
buffer
1st time information
Division section
Time
information
extraction
section
2nd time
information
736
2nd
buffer
735
793
Reproduction
means
778
718a
724
1
2
GOP
722a
GOP

FIG. 3

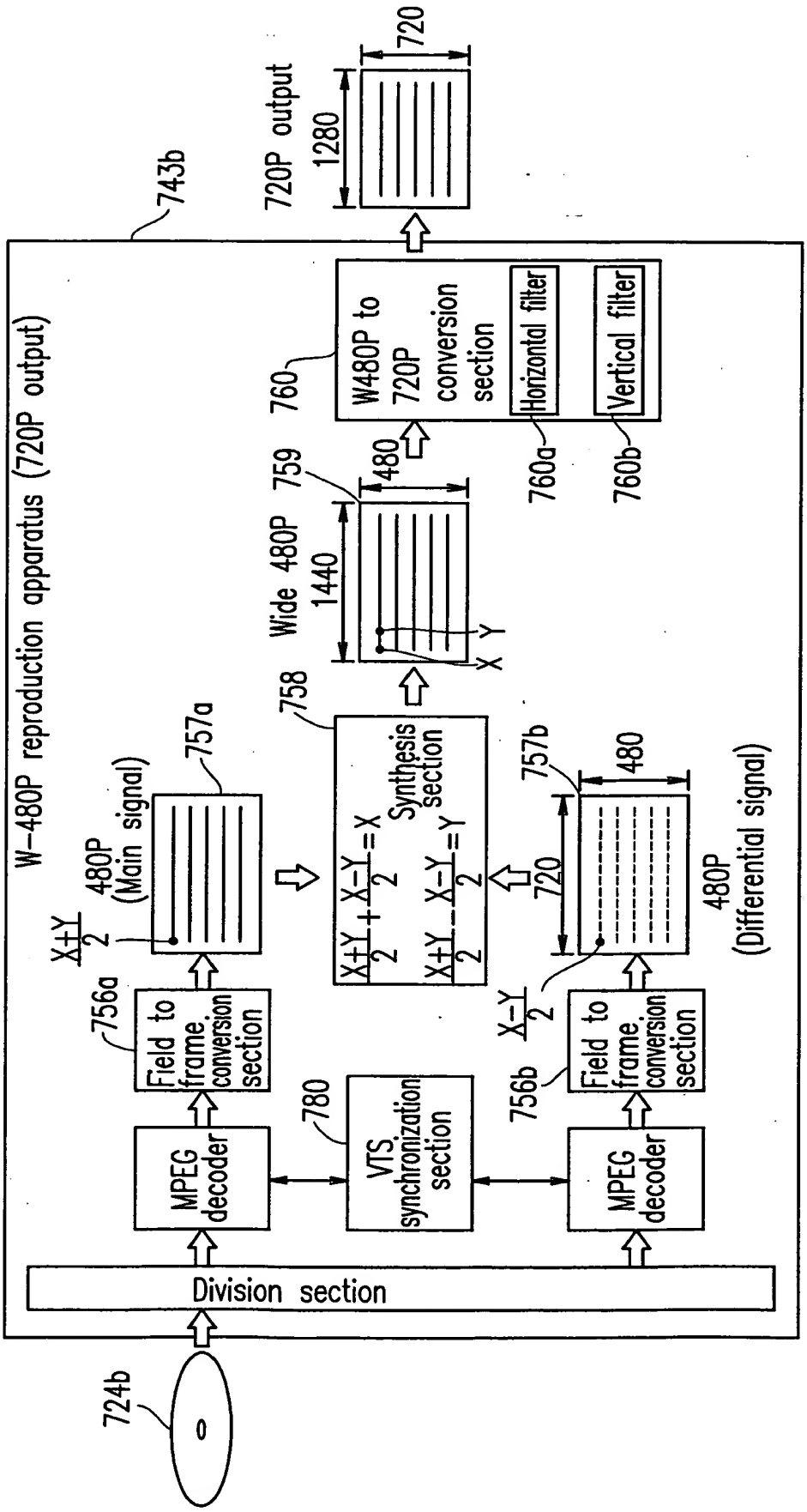
724b
Division section
MPEG decoder
Field to frame conversion section
756a
780
VTS synchronization section
MPEG decoder
Field to frame conversion section
756b
480P (Main signal)
480P (Differential signal)
757a
757b
480
720
X+Y/2
X-Y/2
X+Y/2 + X-Y/2 = X
X+Y/2 - X-Y/2 = Y
Synthesis section
758
Wide 480P
1440
759
480
X
Y
W480P to 720P conversion section
760
Horizontal filter
Vertical filter
760a
760b
720P output
1280
720
743b
W-480P reproduction apparatus (720P output)

FIG. 4

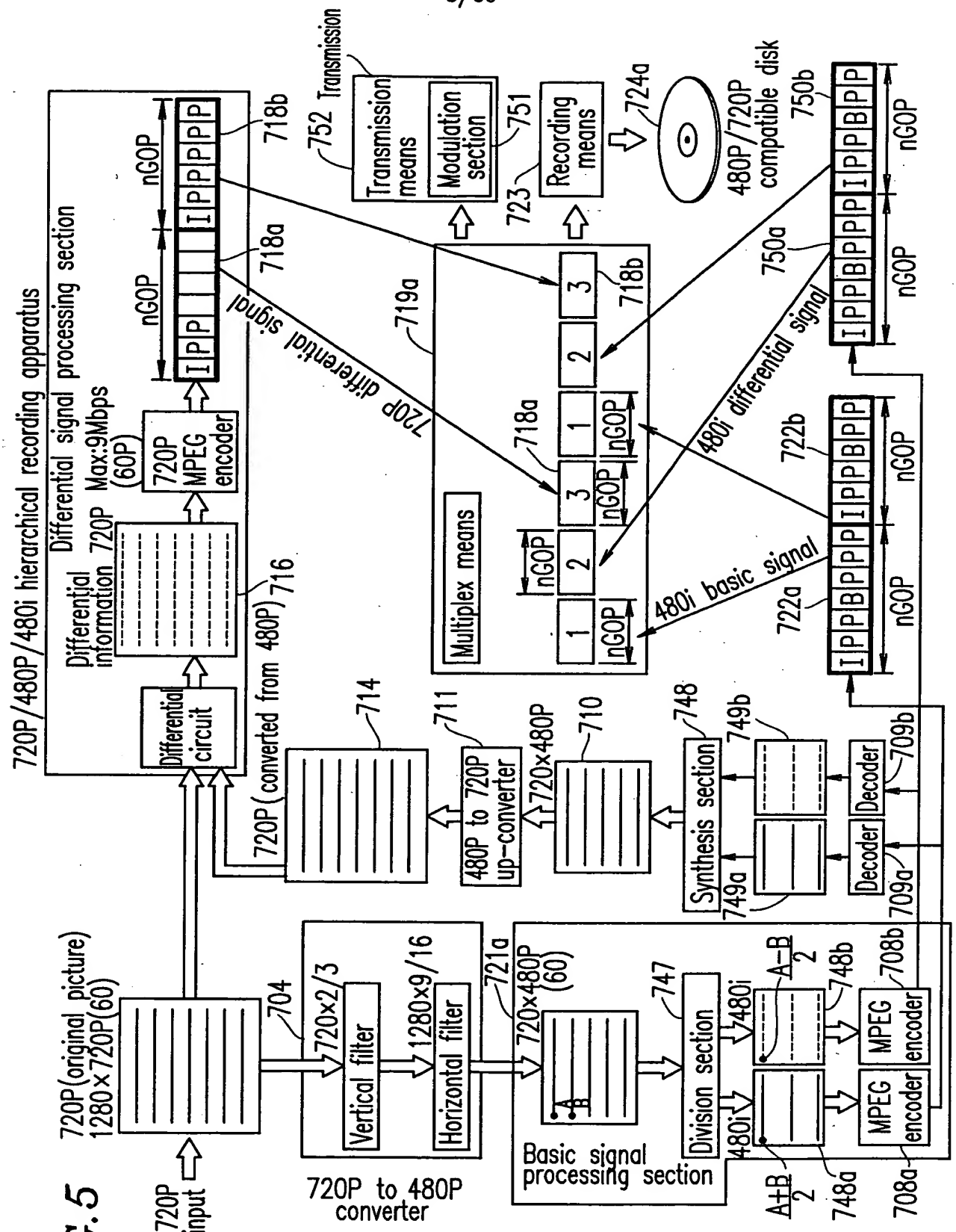
720P/480P/480i hierarchical recording apparatus
Differential signal processing section
Differential information 720P
Differential circuit
720P MPEG encoder
Max:9Mbps (60P)
720P (converted from 480P)
716
718a
718b
nGOP
I P P P P P P
720P differential signal
719a
Multiplex means
480i differential signal
480i basic signal
722a
722b
750a
750b
480P/720P compatible disk
724a
Recording means
723
Modulation section
751
Transmission means
752 Transmission
714
711
480P to 720P up-converter
720×480P
710
748
Synthesis section
749a
749b
Decoder
709a
709b
720P(original picture) 1280×720P(60)
704
720×2/3
Vertical filter
1280×9/16
Horizontal filter
721a
720×480P (60)
747
Division section
480i
A−B 2
A+B 2
748a
748b
MPEG encoder
708a
708b
720P input
720P to 480P converter
Basic signal processing section

FIG. 5

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FIG. 6

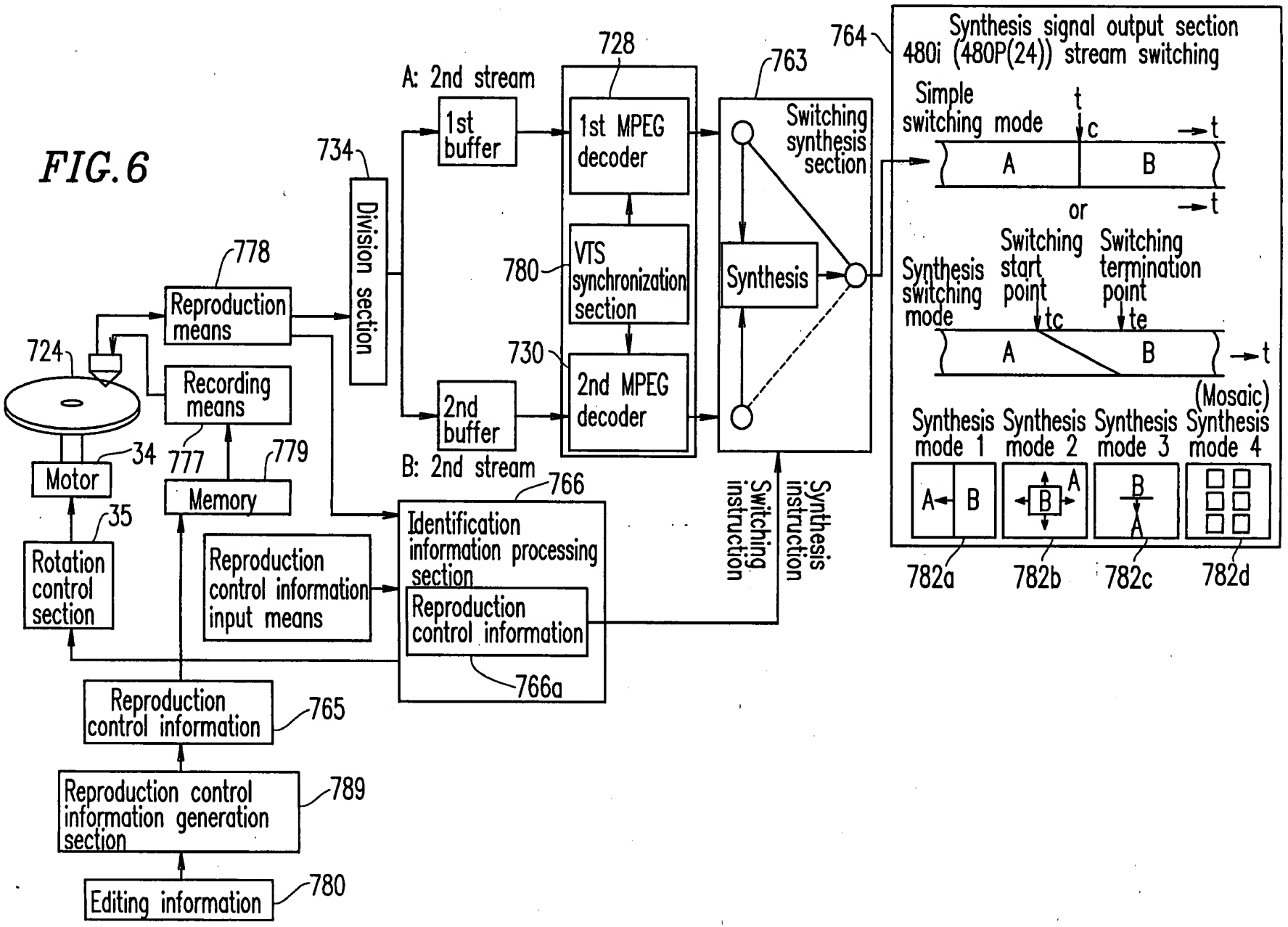
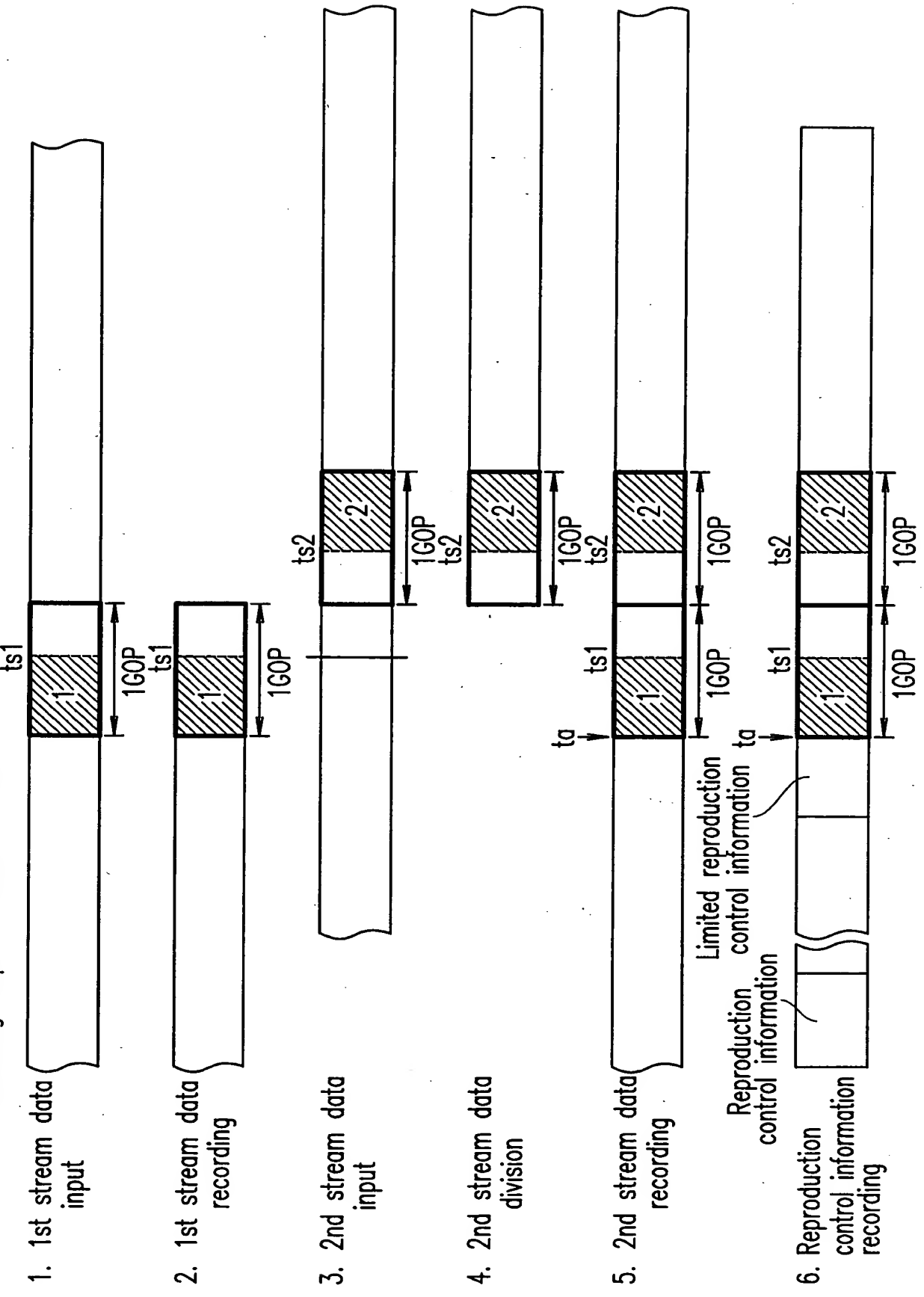


FIG. 7


Recording steps of stream 1 and 2
1. 1st stream data input
2. 1st stream data recording
3. 2nd stream data input
4. 2nd stream data division
5. 2nd stream data recording
6. Reproduction control information recording
ts1
ts2
1GOP
ta
Limited reproduction control information
Reproduction control information

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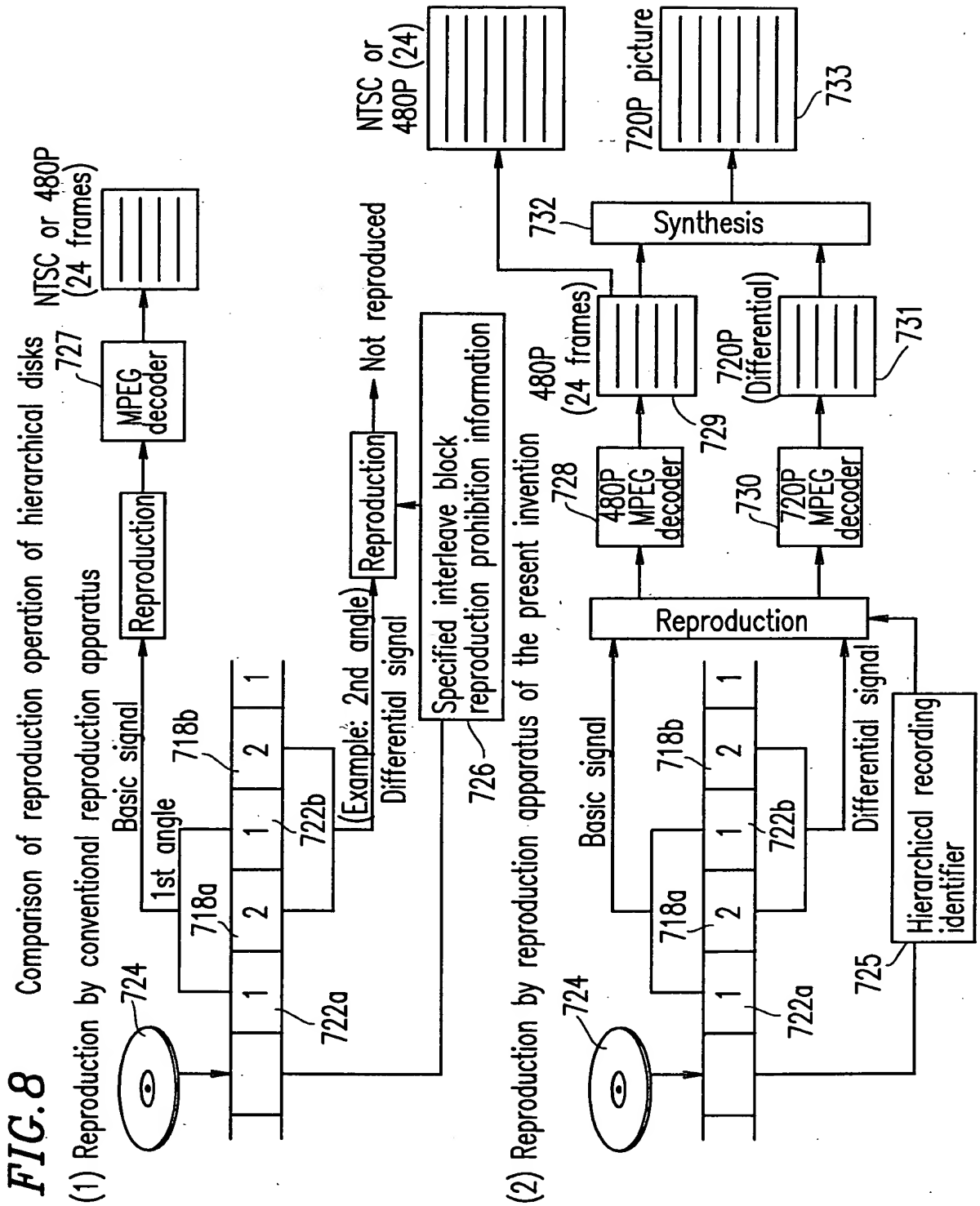
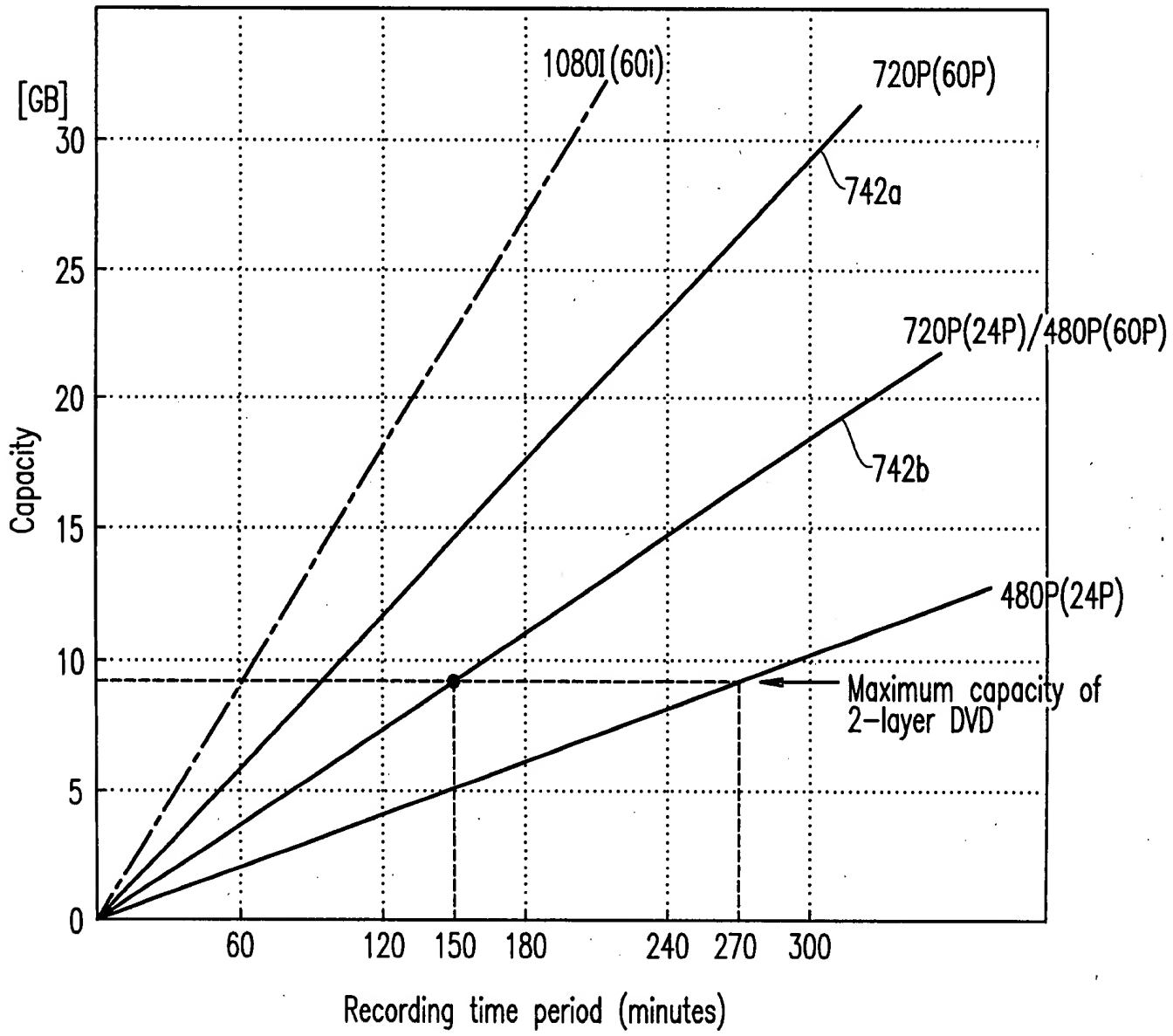



FIG. 8 Comparison of reproduction operation of hierarchical disks

*FIG. 9*

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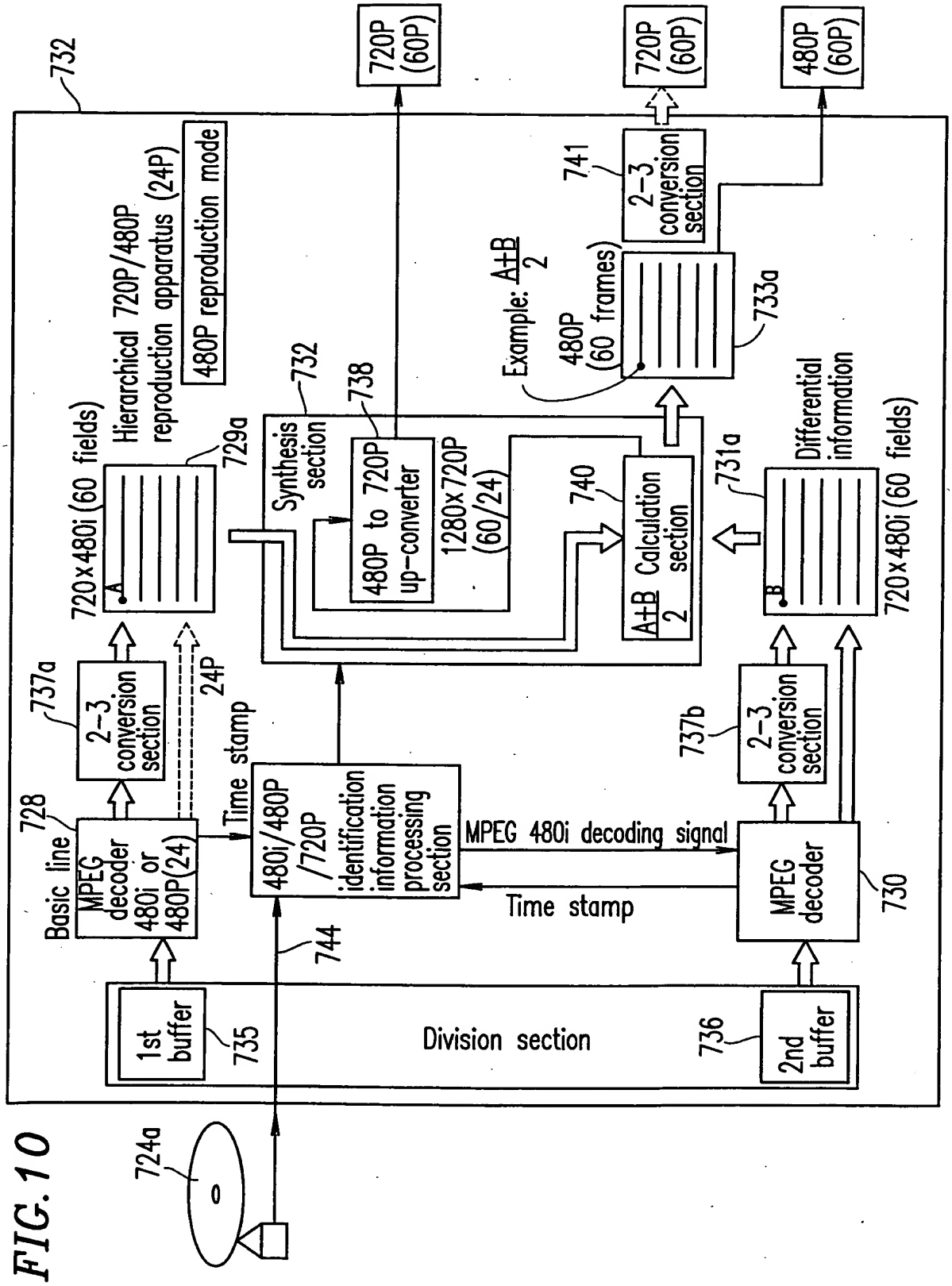
732
720P (60P)
720P (60P)
480P (60P)
741
2-3 conversion section
Example: A+B / 2
480P (60 frames)
733a
Hierarchical 720P/480P reproduction apparatus (24P)
480P reproduction mode
720x480i (60 fields)
729a
Synthesis section
738
480P to 720P up-converter
1280x720P (60/24)
740
A+B / 2 Calculation section
731a
Differential information
720x480i (60 fields)
737a
2-3 conversion section
24P
Time stamp
737b
2-3 conversion section
728
Basic line MPEG decoder 480i or 480P(24)
480i/480P /720P identification information processing section
MPEG 480i decoding signal
Time stamp
MPEG decoder
730
744
1st buffer
735
Division section
736
2nd buffer
724a

FIG. 10

*FIG. 11* Reproduction control information

| 766 Switching point number S | 767 Picture synthesis identifier | 1st stream | | 2nd stream | | | |
|---|---|---|---|---|---|---|---|
| | | 768 Switching start address:ts1 | 769 Switching termination address:te2 | 770 GOP start address:tsG | 771 Switching start address:ts2 | 772 Switching termination address:te2 | 773 Decoding start address:ta |
| 1 | None | ts1-1 | | tsG-1 | ts2-1 | | ta1 |
| 2 | Mode 1 | ts1-2 | te2-2 | tsG-2 | ts2-2 | te2-2 | ta2 |
| 3 | Mode 2 | ts1-3 | te2-3 | tsG-3 | ts2-3 | te2-3 | ta3 |
| | | | | | | | |



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FIG. 12

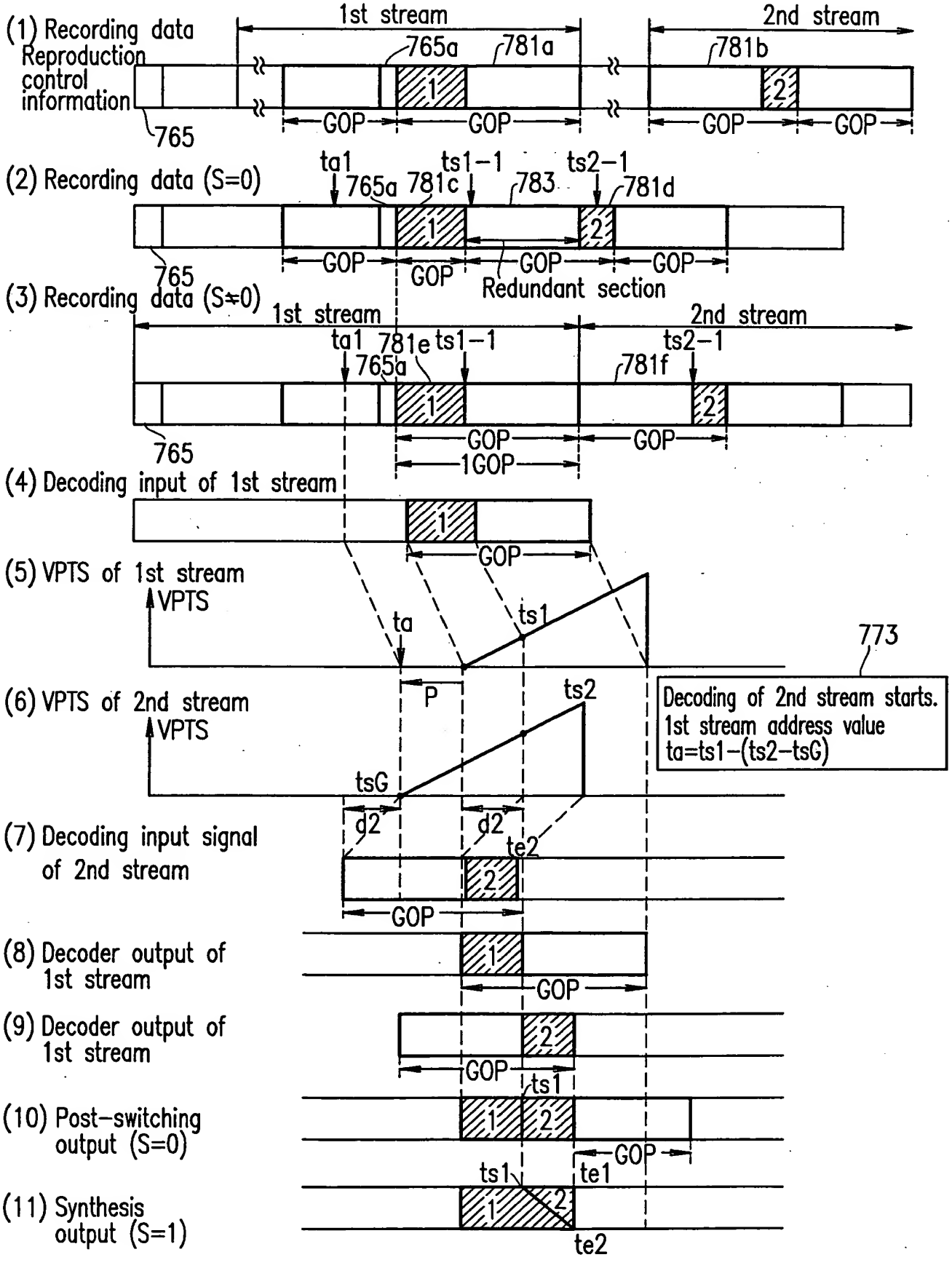
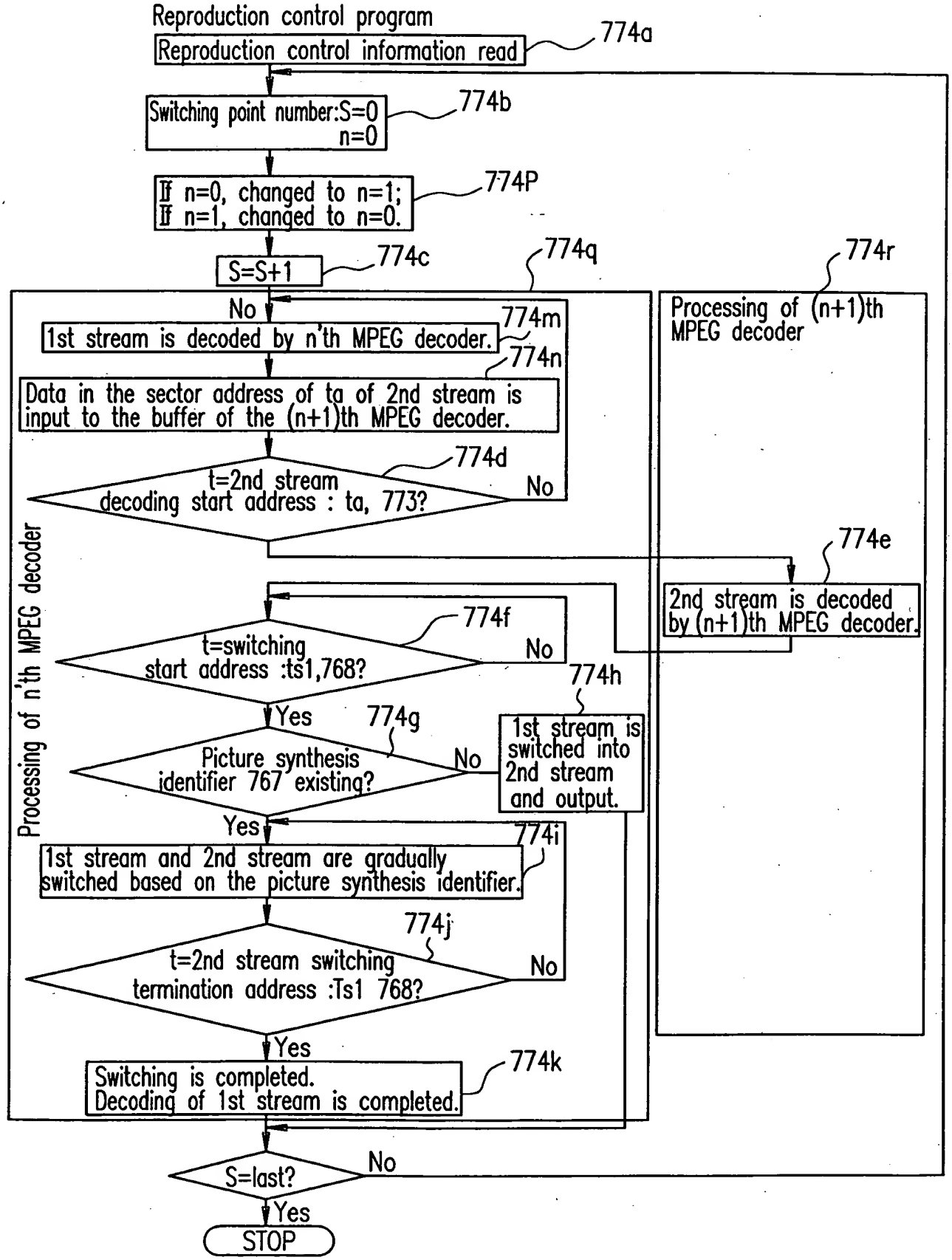

(1) Recording data
Reproduction control information
765
1st stream
2nd stream
765a
781a
781b
GOP
(2) Recording data (S=0)
ta1
ts1−1
ts2−1
765a
781c
783
781d
Redundant section
(3) Recording data (S≠0)
781e
781f
1GOP
(4) Decoding input of 1st stream
(5) VPTS of 1st stream
VPTS
ta
ts1
773
(6) VPTS of 2nd stream
P
ts2
tsG
Decoding of 2nd stream starts.
1st stream address value
ta=ts1−(ts2−tsG)
(7) Decoding input signal of 2nd stream
d2
te2
(8) Decoder output of 1st stream
(9) Decoder output of 1st stream
(10) Post−switching output (S=0)
(11) Synthesis output (S=1)
te1
te2

FIG. 13




Reproduction control program
Reproduction control information read
774a
Switching point number:S=0
n=0
774b
If n=0, changed to n=1;
If n=1, changed to n=0.
774P
S=S+1
774c
774q
774r
No
1st stream is decoded by n'th MPEG decoder.
774m
Data in the sector address of ta of 2nd stream is input to the buffer of the (n+1)th MPEG decoder.
774n
t=2nd stream decoding start address : ta, 773?
774d
No
Processing of (n+1)th MPEG decoder
774e
2nd stream is decoded by (n+1)th MPEG decoder.
Processing of n'th MPEG decoder
t=switching start address :ts1,768?
774f
No
Yes
774h
1st stream is switched into 2nd stream and output.
Picture synthesis identifier 767 existing?
774g
No
Yes
1st stream and 2nd stream are gradually switched based on the picture synthesis identifier.
774i
t=2nd stream switching termination address :Ts1 768?
774j
No
Yes
Switching is completed.
Decoding of 1st stream is completed.
774k
S=last?
No
Yes
STOP

005030 82598460

*FIG. 14*

Reproduction control information

| 766 Switching point number S | 767 Picture synthesis identifier S | 768 1st stream | 769 | 770a 2nd stream | 765b | 771 |
|---|---|---|---|---|---|---|
| | | Switching start address : ts1 | Switching termination address : te2 | GOP start address : tsG Sector address:tsGs | Switching start address : ts2 Sector address | |
| 1 | None | ts1-1 | | tsG-1 | ts2-1 | |
| 2 | Mode1 | ts1-2 | te2-2 | tsG-2 | ts2-2 | |
| 3 | Mode2 | ts1-3 | te2-3 | tsG-3 | ts2-3 | |



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FIG. 15



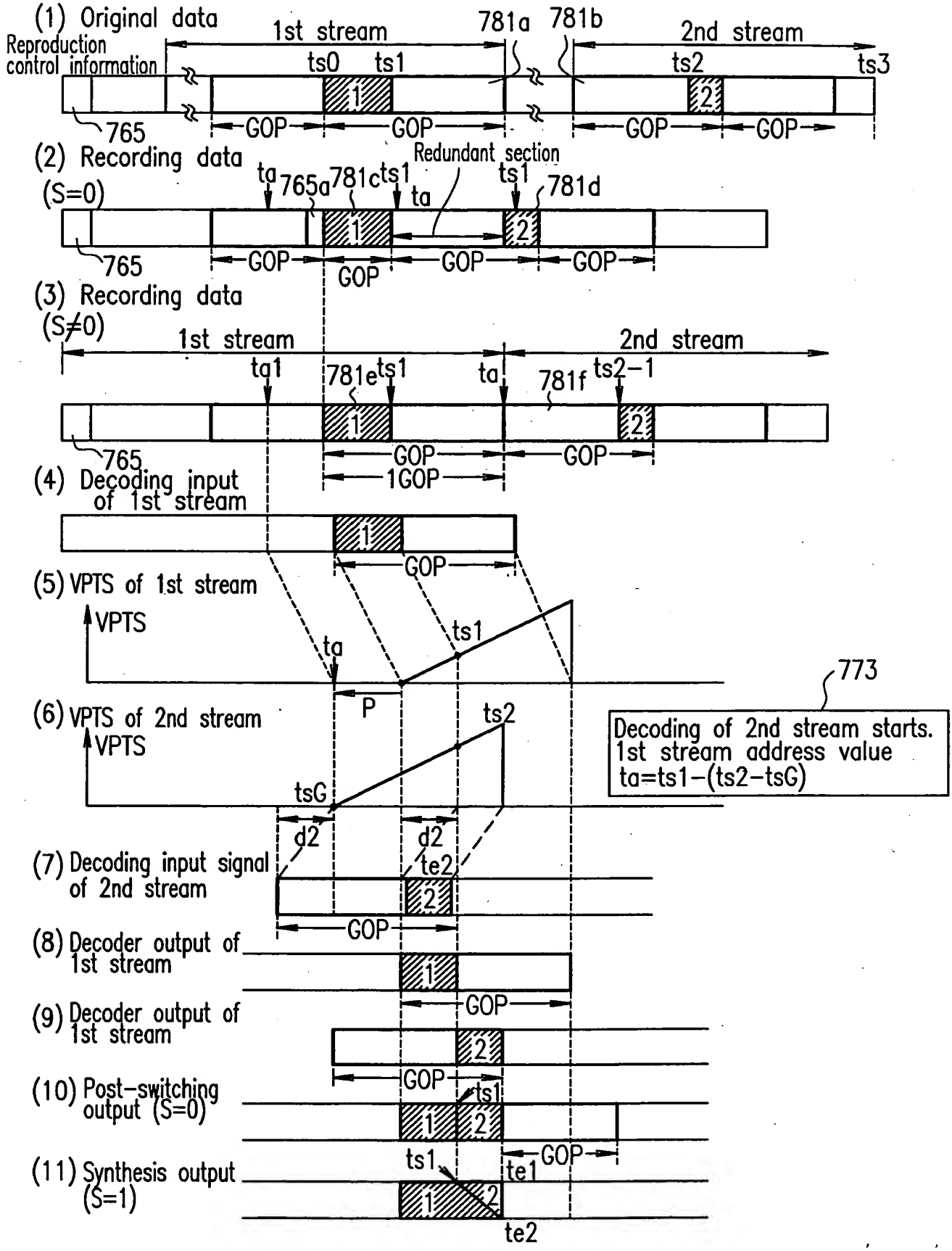
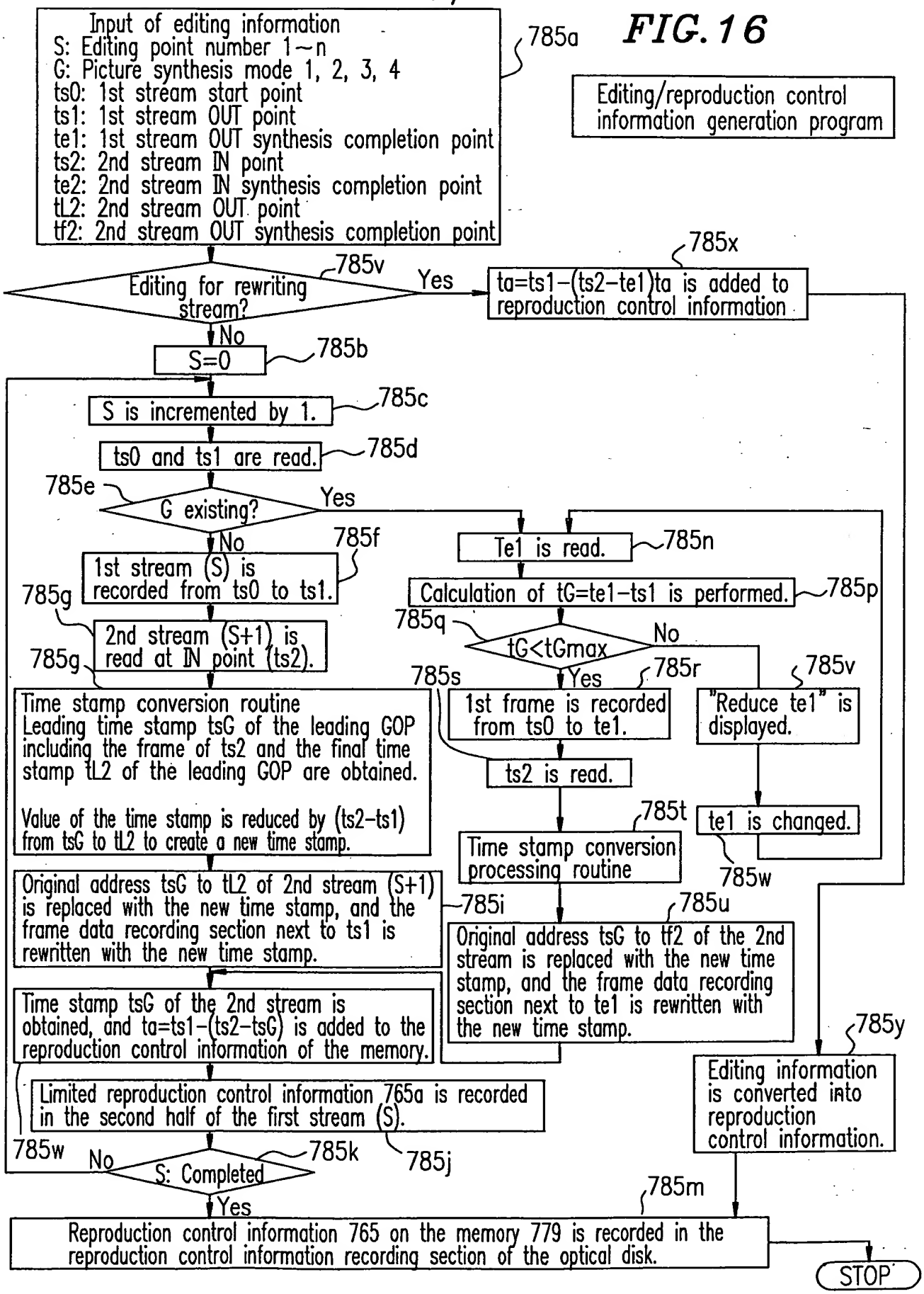

(1) Original data
Reproduction control information
1st stream
781a
781b
2nd stream
ts0
ts1
ts2
ts3
765
GOP
(2) Recording data
(S=0)
ta
765a
781c
ts1
Redundant section
781d
(3) Recording data
(S≠0)
1st stream
2nd stream
ta1
781e
781f
ts2−1
1GOP
(4) Decoding input of 1st stream
(5) VPTS of 1st stream
VPTS
P
(6) VPTS of 2nd stream
tsG
d2
te2
(7) Decoding input signal of 2nd stream
(8) Decoder output of 1st stream
(9) Decoder output of 1st stream
(10) Post-switching output (S=0)
(11) Synthesis output (S=1)
te1
te2
773
Decoding of 2nd stream starts.
1st stream address value
ta=ts1−(ts2−tsG)

FIG. 16


Input of editing information
S: Editing point number 1~n
G: Picture synthesis mode 1, 2, 3, 4
ts0: 1st stream start point
ts1: 1st stream OUT point
te1: 1st stream OUT synthesis completion point
ts2: 2nd stream IN point
te2: 2nd stream IN synthesis completion point
tL2: 2nd stream OUT point
tf2: 2nd stream OUT synthesis completion point
785a
Editing/reproduction control information generation program
Editing for rewriting stream?
785v
Yes
ta=ts1-(ts2-te1)ta is added to reproduction control information
785x
No
S=0
785b
S is incremented by 1.
785c
ts0 and ts1 are read.
785d
G existing?
785e
Yes
No
1st stream (S) is recorded from ts0 to ts1.
785f
2nd stream (S+1) is read at IN point (ts2).
785g
Time stamp conversion routine
Leading time stamp tsG of the leading GOP including the frame of ts2 and the final time stamp tL2 of the leading GOP are obtained.
Value of the time stamp is reduced by (ts2-ts1) from tsG to tL2 to create a new time stamp.
Original address tsG to tL2 of 2nd stream (S+1) is replaced with the new time stamp, and the frame data recording section next to ts1 is rewritten with the new time stamp.
785i
Time stamp tsG of the 2nd stream is obtained, and ta=ts1-(ts2-tsG) is added to the reproduction control information of the memory.
Limited reproduction control information 765a is recorded in the second half of the first stream (S).
785j
S: Completed
785k
No
Yes
785w
Te1 is read.
785n
Calculation of tG=te1-ts1 is performed.
785p
tG<tGmax
785q
No
Yes
1st frame is recorded from ts0 to te1.
785r
ts2 is read.
785s
Time stamp conversion processing routine
785t
Original address tsG to tf2 of the 2nd stream is replaced with the new time stamp, and the frame data recording section next to te1 is rewritten with the new time stamp.
785u
"Reduce te1" is displayed.
785v
te1 is changed.
785w
Editing information is converted into reproduction control information.
785y
Reproduction control information 765 on the memory 779 is recorded in the reproduction control information recording section of the optical disk.
785m
STOP

005090 "82598n60

*FIG. 17* Progressive/3D image arrangement information (resolution/picture identification information)

83 ~ TXTDT file | PGC file in each VTS ~ 744

14

| VTS (title) | Cell | TXTDT information: Attribute | TXTDT information: Number of multiple angles | Angle | | Start address | Termination address | Identification information |
|---|---|---|---|---|---|---|---|---|
| 1 | 1, 2 | 3D Cell1, 2 | 2 | 1 | Main | $a_1$ | $a_3$ | 3D-right |
| | | | | 2 | Sub | $a_2$ | $a_4$ | 3D-left |
| 2 | 1, 2 | 3D Cell1, 2 | 2 | 1 | Main | $a_5$ | $a_7$ | 3D-right |
| | | | | 2 | Sub | $a_6$ | $a_8$ | 3D-left |
| | 3, 4 | Progressive 480P X multiple angles (Cell1, 2) | 4 | 1 | Main | $a_9$ | $a_{11}$ | 1-480P-main |
| | | | | 2 | Sub | $a_{10}$ | $a_{12}$ | 1-480P-sub |
| | | | | 3 | Main | $a_{13}$ | $a_{15}$ | 2-480P-main |
| | | | | 4 | Sub | $a_{14}$ | $a_{16}$ | 2-480P-sub |
| 3 | 1, 2 | Wide480P (Cell1, 2) | 2 | 1 | Main | $a_{17}$ | $a_{19}$ | Wide480i-main |
| | | | | 2 | Sub | $a_{18}$ | $a_{20}$ | Wide480i-sub |
| 4 | 1, 2 | Wide480P | 4 | 1 | Main | $a_{21}$ | $a_{22}$ | Wide480P-main main |
| | | | | 2 | Sub | $a_{23}$ | $a_{24}$ | Wide480P-main sub |
| | | | | 3 | Main | $a_{25}$ | $a_{26}$ | Wide480P-sub main |
| | | | | 4 | Sub | $a_{27}$ | $a_{28}$ | Wide480P-sub sub |
| 5 | 1, 2 3, 4 | 3D480P | 4 | 1 | Main | $a_{29}$ | $a_{30}$ | Right480P-main |
| | | | | 2 | Sub | $a_{31}$ | $a_{32}$ | Right480P-sub |
| | | | | 3 | Main | $a_{33}$ | $a_{34}$ | Left480P-main |
| | | | | 4 | Sub | $a_{35}$ | $a_{36}$ | Left480P-sub |
| 6 | 1, 2 | 720P (24fps) | 2 | 1 | Main | $a_{37}$ | $a_{38}$ | 720P-main |
| | | | | 2 | Sub | $a_{39}$ | $a_{40}$ | 720P-sub |



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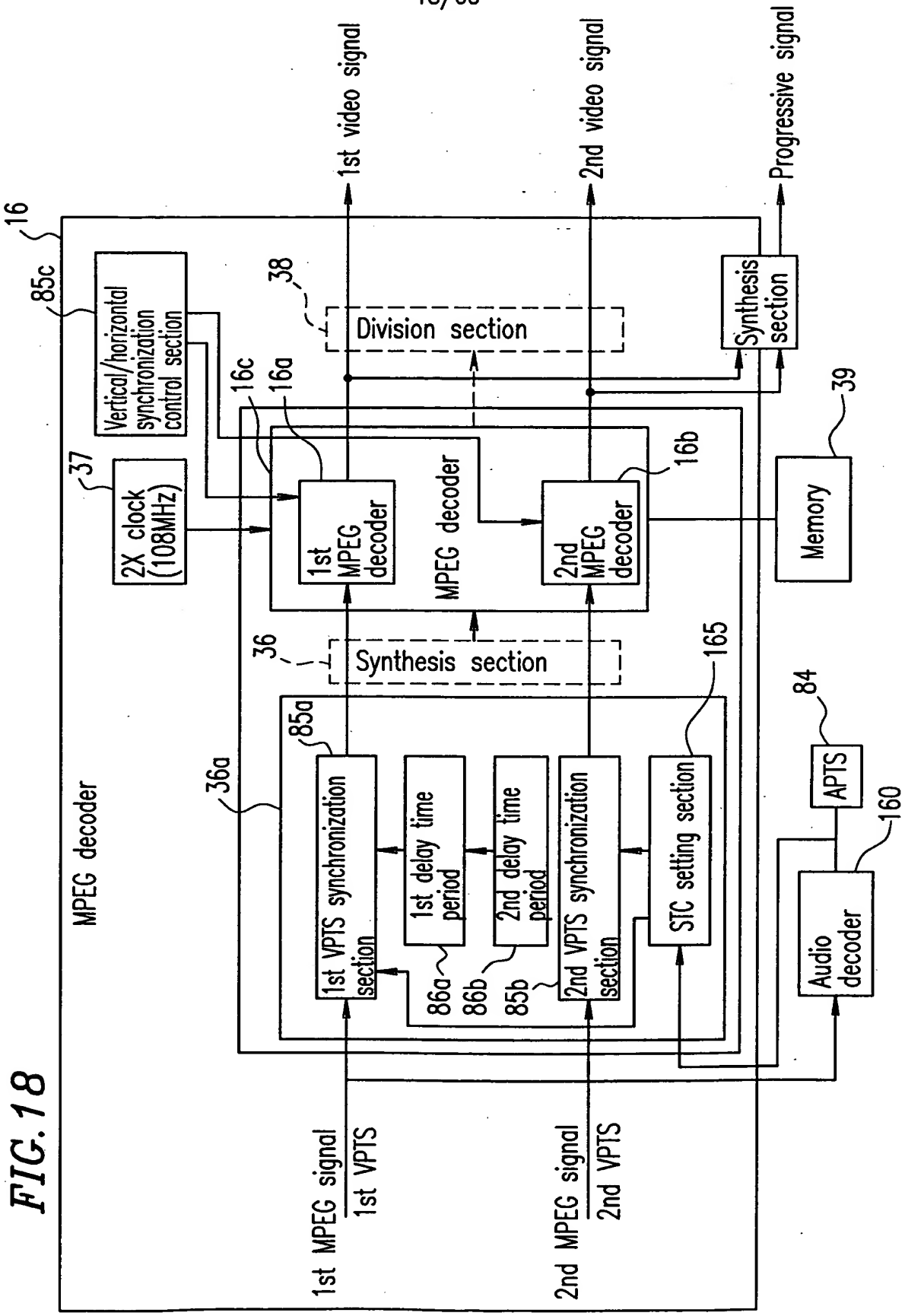
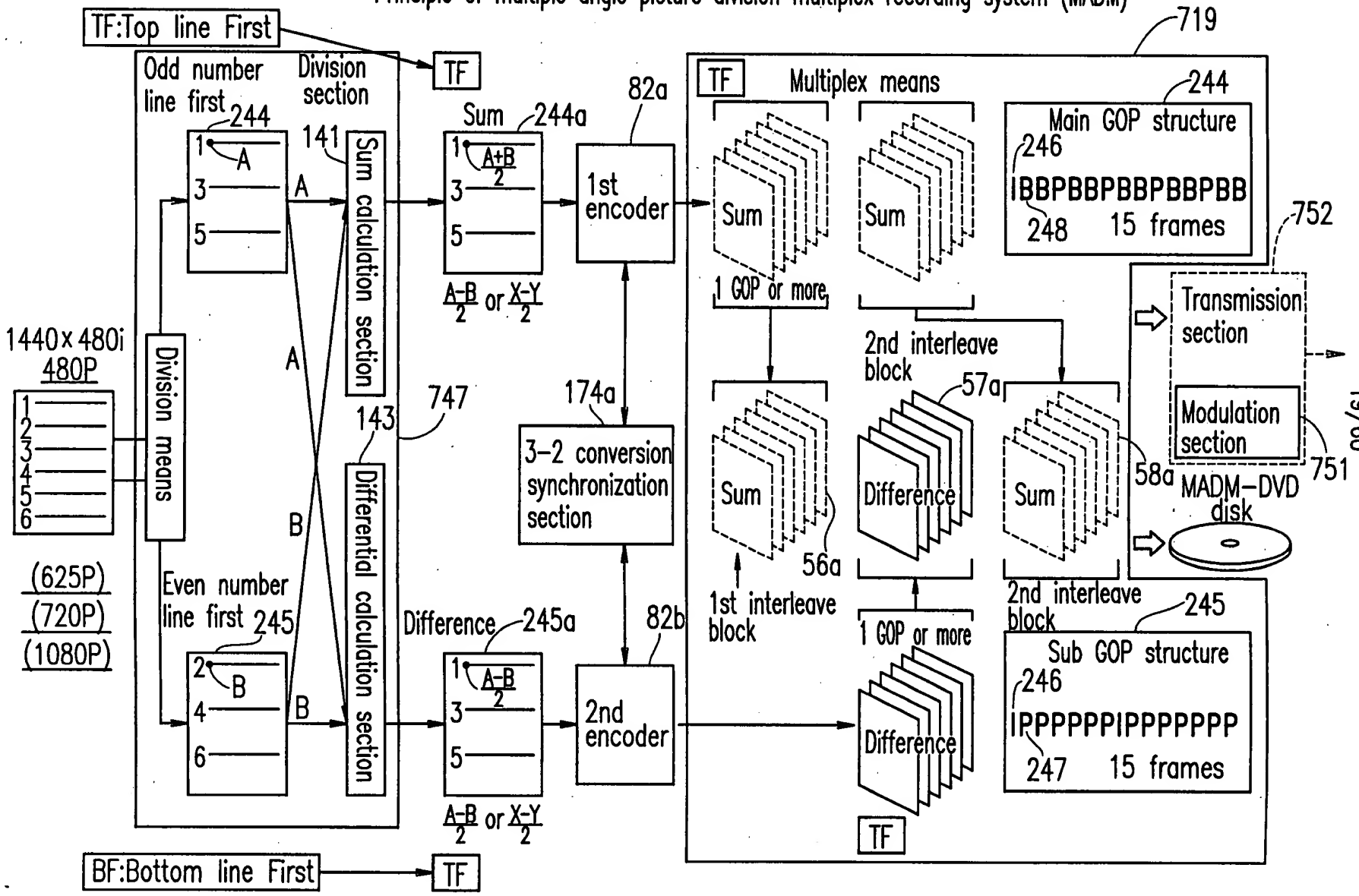



FIG. 18

*FIG. 19*

Principle of multiple angle picture division multiplex recording system (MADM)



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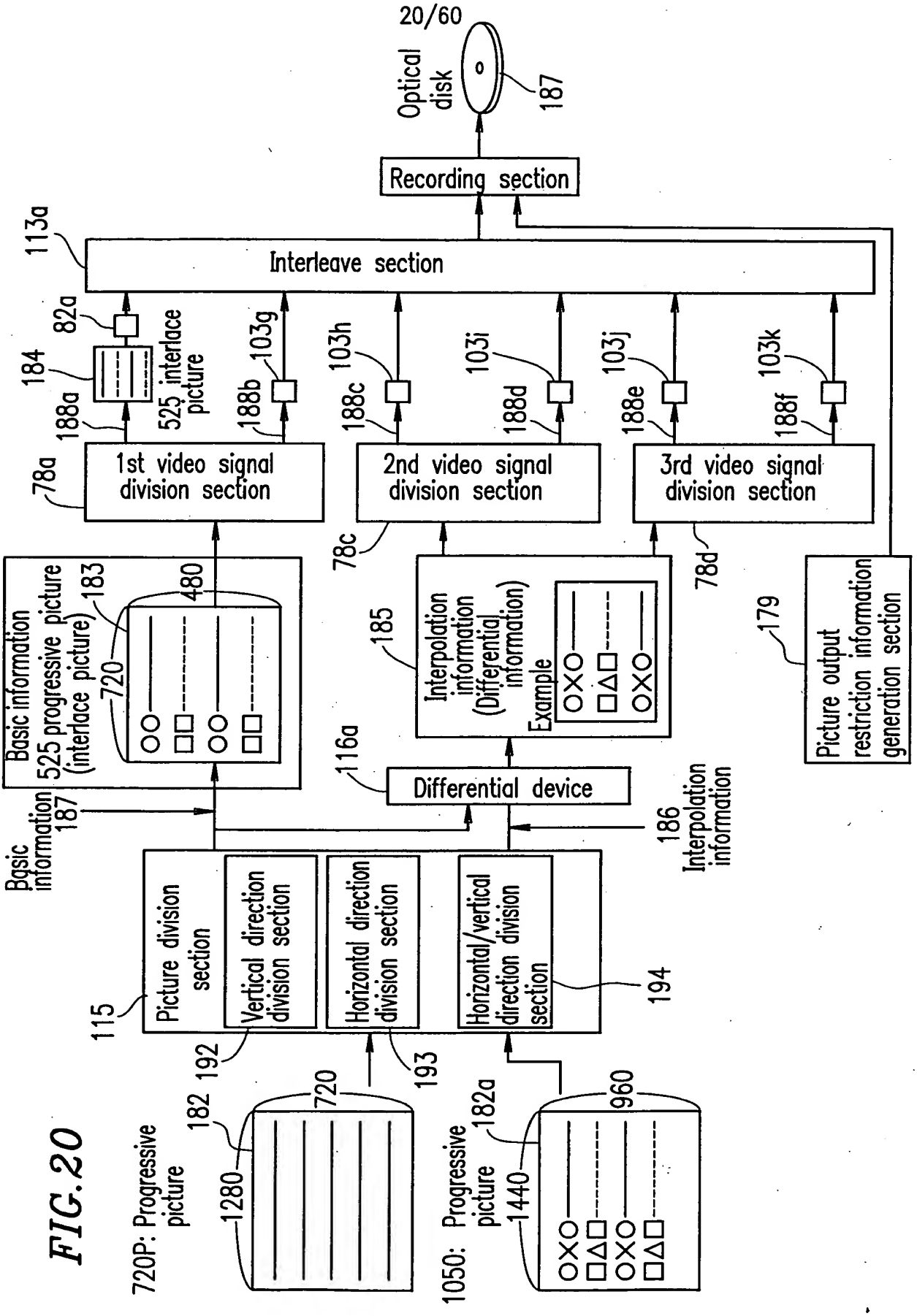

20/60
Optical disk
187
Recording section
113a
Interleave section
82a
184
525 interlace picture
188a
188b
103g
188c
103h
188d
103i
188e
103j
188f
103k
78a
1st video signal division section
2nd video signal division section
3rd video signal division section
78c
78d
Basic information 525 progressive picture (interlace picture)
183
480
720
185
Interpolation information (Differential information)
Example
179
Picture output restriction information generation section
116a
Differential device
Basic information 187
186 Interpolation information
115
Picture division section
Vertical direction division section
Horizontal direction division section
Horizontal/vertical direction division section
194
192
193
182
720
1280
720P: Progressive picture
182a
960
1440
1050: Progressive picture

FIG. 20

*FIG. 21*

Principle of multiple angle picture division multiplex system (MADM)

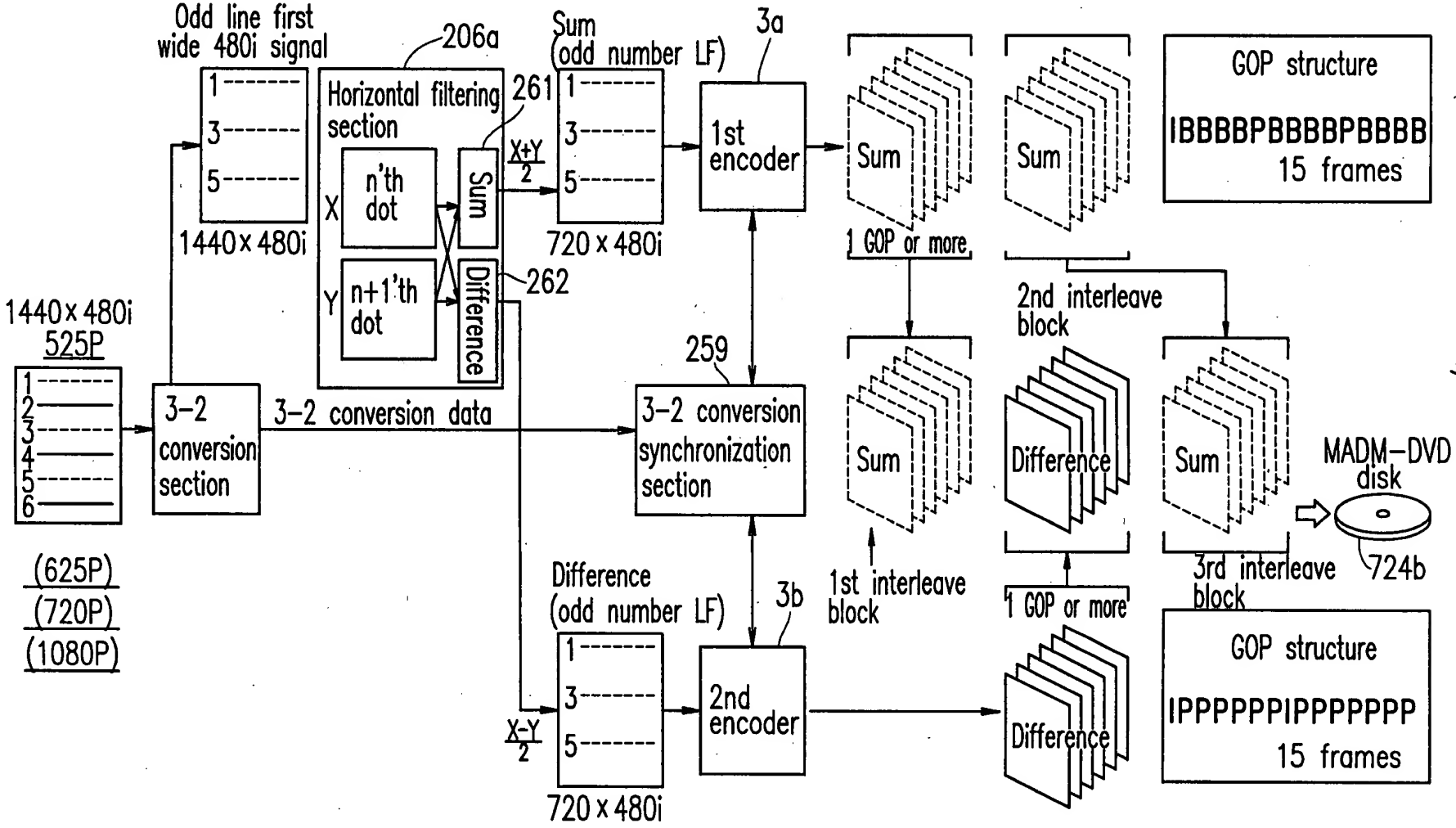


FIG.22

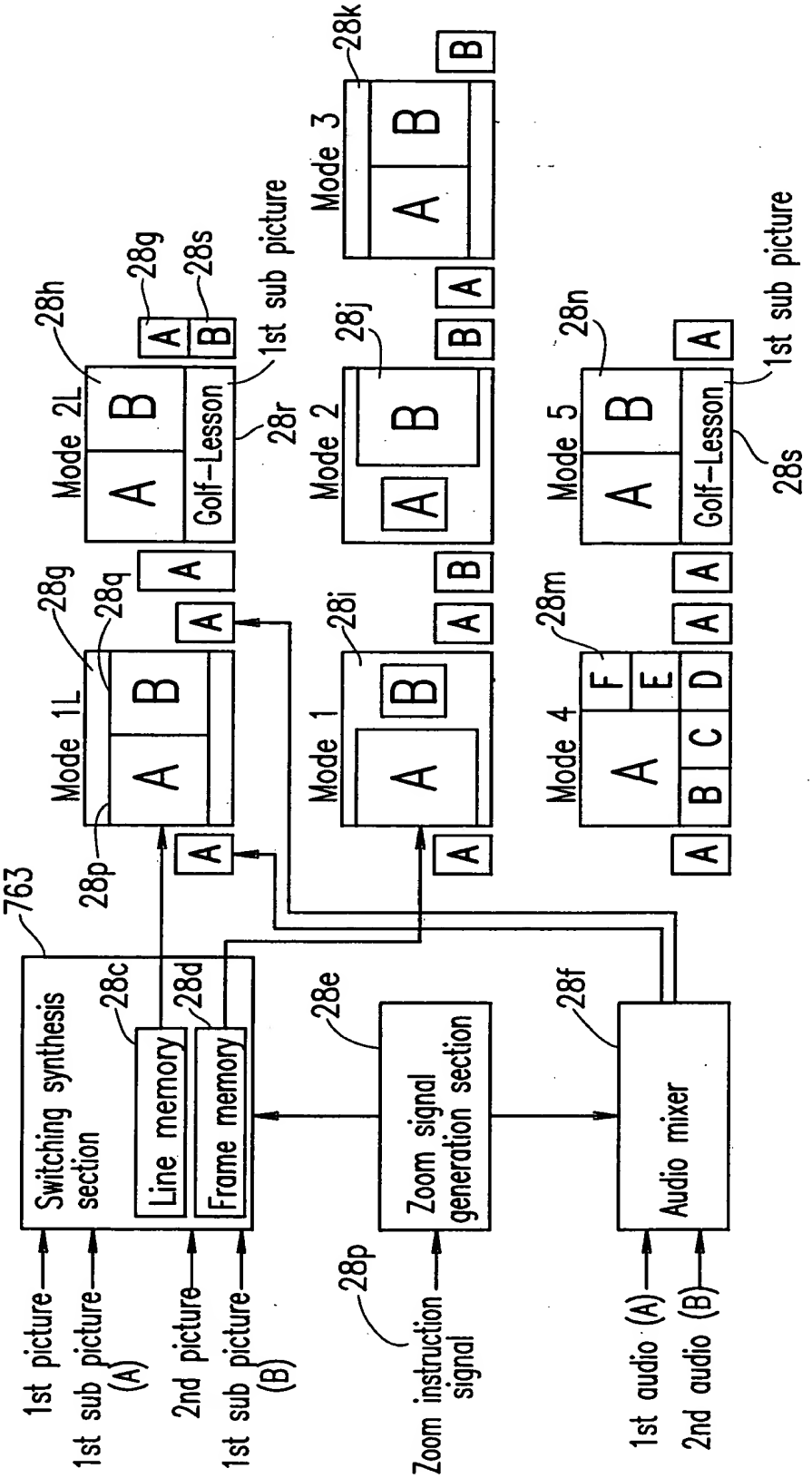

763
Switching synthesis section
28c
Line memory
28d
Frame memory
28e
Zoom signal generation section
28f
Audio mixer
28p
1st picture
1st sub picture (A)
2nd picture
1st sub picture (B)
Zoom instruction signal
1st audio (A)
2nd audio (B)
Mode 1
Mode 1L
Mode 2
Mode 2L
Mode 3
Mode 4
Mode 5
Golf-Lesson
1st sub picture
28g
28q
28h
28s
28r
28i
28j
28k
28m
28n

FIG.23

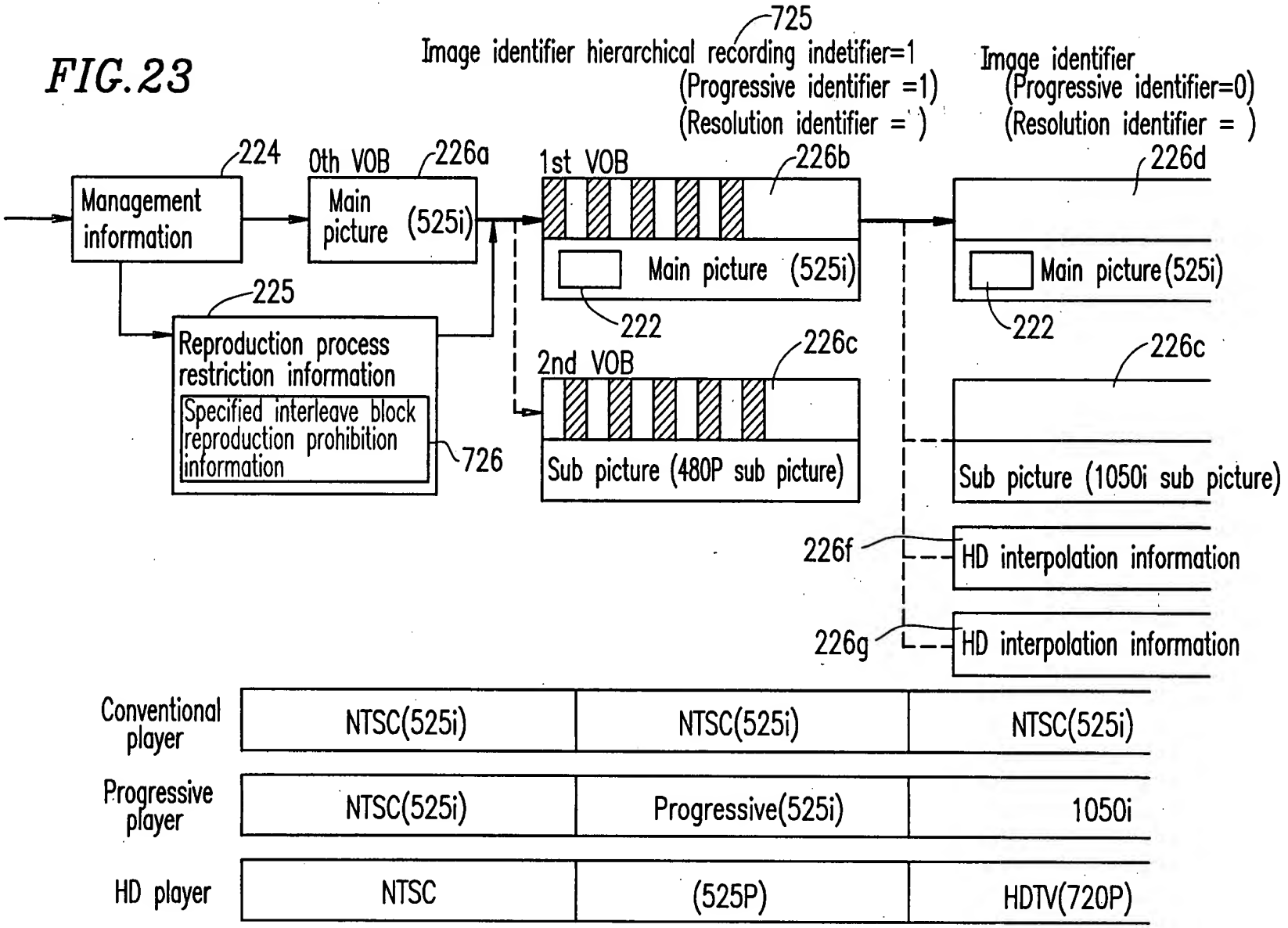
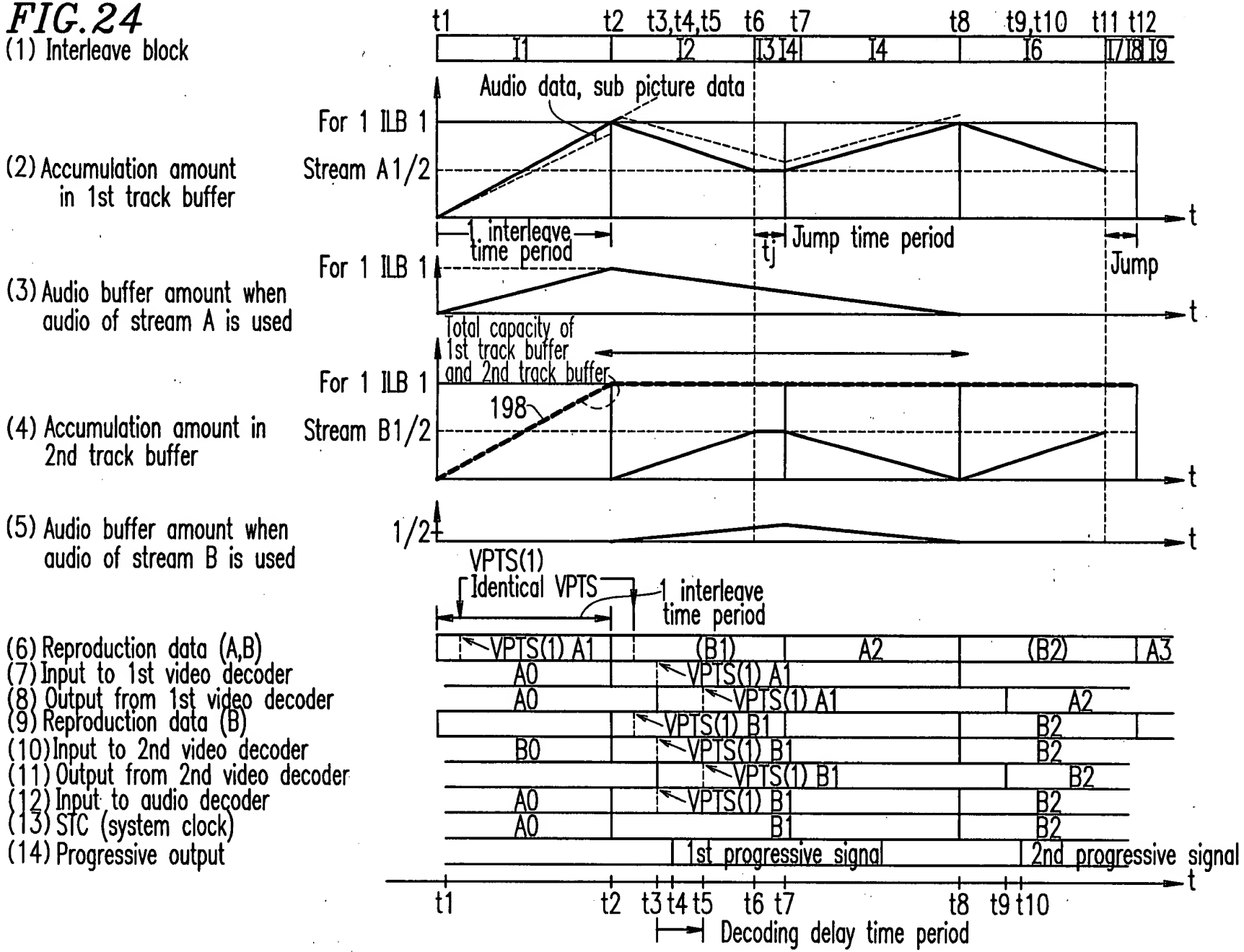

725
Image identifier hierarchical recording indetifier=1
(Progressive identifier =1)
(Resolution identifier = )
Image identifier
(Progressive identifier=0)
(Resolution identifier = )
224
Management information
0th VOB
226a
Main picture (525i)
1st VOB
226b
Main picture (525i)
222
226d
Main picture(525i)
222
225
Reproduction process restriction information
Specified interleave block reproduction prohibition information
726
2nd VOB
226c
Sub picture (480P sub picture)
226c
Sub picture (1050i sub picture)
226f
HD interpolation information
226g
HD interpolation information
Conventional player
NTSC(525i)
NTSC(525i)
NTSC(525i)
Progressive player
NTSC(525i)
Progressive(525i)
1050i
HD player
NTSC
(525P)
HDTV(720P)

*FIG. 24*


(1) Interleave block
t1
t2
t3,t4,t5
t6
t7
t8
t9,t10
t11 t12
I1
I2
I3 I4
I4
I6
I7 I8 I9
Audio data, sub picture data
(2) Accumulation amount in 1st track buffer
For 1 ILB 1
Stream A1/2
t
1 interleave time period
Jump time period
tj
Jump
(3) Audio buffer amount when audio of stream A is used
For 1 ILB 1
t
Total capacity of 1st track buffer and 2nd track buffer
(4) Accumulation amount in 2nd track buffer
For 1 ILB 1
198
Stream B1/2
t
(5) Audio buffer amount when audio of stream B is used
1/2
t
VPTS(1)
Identical VPTS
1 interleave time period
(6) Reproduction data (A,B)
(7) Input to 1st video decoder
(8) Output from 1st video decoder
(9) Reproduction data (B)
(10) Input to 2nd video decoder
(11) Output from 2nd video decoder
(12) Input to audio decoder
(13) STC (system clock)
(14) Progressive output
VPTS(1) A1
(B1)
A2
(B2)
A3
A0
VPTS(1) A1
A0
VPTS(1) A1
A2
VPTS(1) B1
B2
B0
VPTS(1) B1
B2
VPTS(1) B1
B2
A0
VPTS(1) B1
B2
A0
B1
B2
1st progressive signal
2nd progressive signal
t
t1
t2
t3 t4 t5
t6 t7
t8
t9 t10
Decoding delay time period

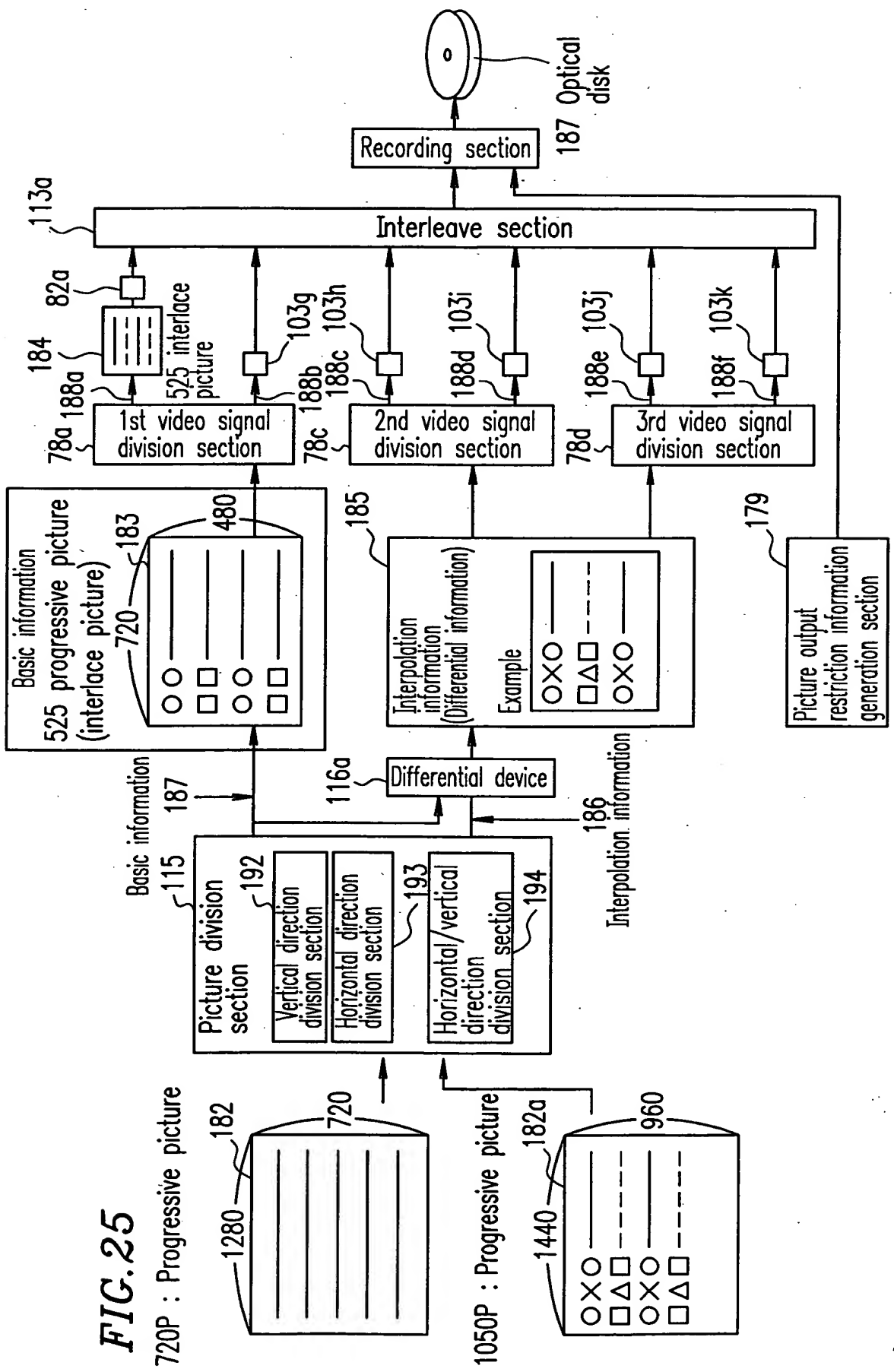

Optical disk
187
Recording section
Interleave section
113a
82a
184
525 interlace picture
188a
103g
103h
188b
188c
103i
188d
103j
188e
103k
188f
1st video signal division section
78a
2nd video signal division section
78c
3rd video signal division section
78d
Basic information
525 progressive picture (interlace picture)
183
480
720
185
Interpolation information (Differential information)
Example
179
Picture output restriction information generation section
Differential device
116a
Basic information
187
186
Interpolation information
Picture division section
115
192
Vertical direction division section
Horizontal direction division section
193
Horizontal/vertical direction division section
194
720P : Progressive picture
182
1280
720
1050P : Progressive picture
182a
1440
960

FIG.25

FIG. 26

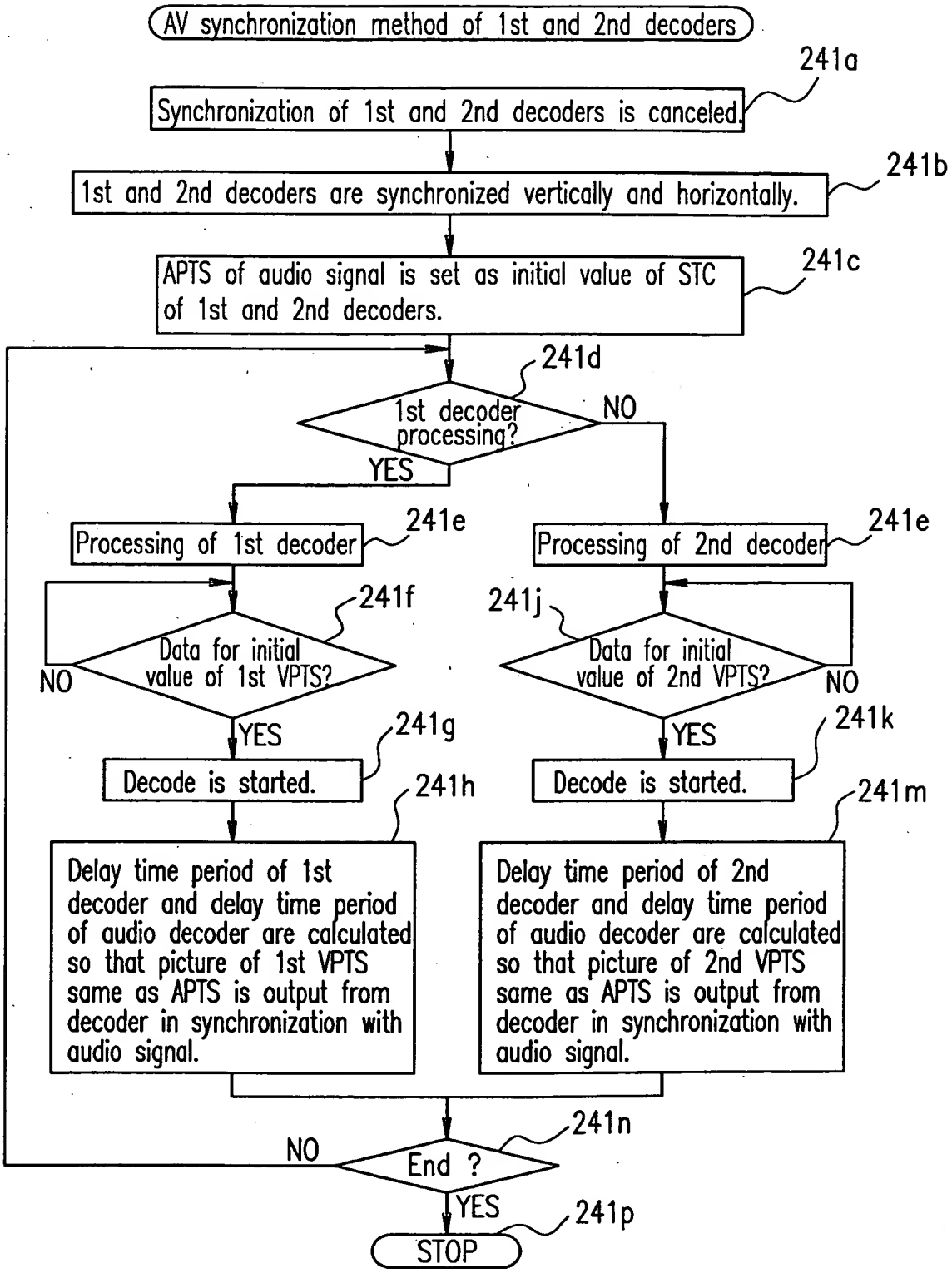

AV synchronization method of 1st and 2nd decoders
241a
Synchronization of 1st and 2nd decoders is canceled.
241b
1st and 2nd decoders are synchronized vertically and horizontally.
241c
APTS of audio signal is set as initial value of STC of 1st and 2nd decoders.
241d
1st decoder processing?
NO
YES
Processing of 1st decoder
241e
Processing of 2nd decoder
241e
241f
Data for initial value of 1st VPTS?
NO
YES
241j
Data for initial value of 2nd VPTS?
NO
YES
241g
Decode is started.
241k
Decode is started.
241h
Delay time period of 1st decoder and delay time period of audio decoder are calculated so that picture of 1st VPTS same as APTS is output from decoder in synchronization with audio signal.
241m
Delay time period of 2nd decoder and delay time period of audio decoder are calculated so that picture of 2nd VPTS same as APTS is output from decoder in synchronization with audio signal.
241n
End ?
NO
YES
241p
STOP

FIG.27

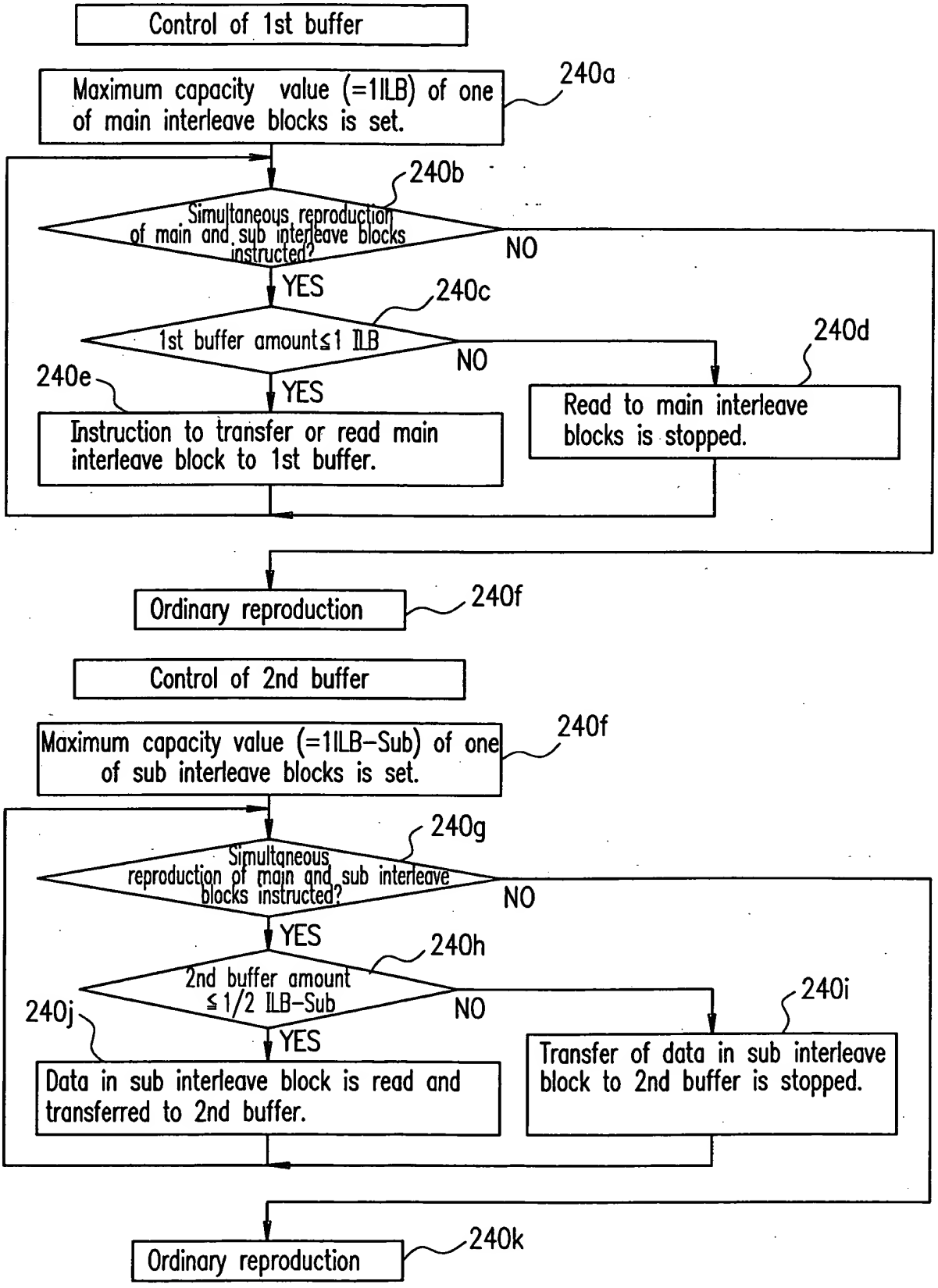

Control of 1st buffer
Maximum capacity value (=1ILB) of one of main interleave blocks is set.
240a
240b
Simultaneous reproduction of main and sub interleave blocks instructed?
NO
YES
240c
1st buffer amount≤1 ILB
NO
240d
YES
240e
Instruction to transfer or read main interleave block to 1st buffer.
Read to main interleave blocks is stopped.
Ordinary reproduction
240f
Control of 2nd buffer
Maximum capacity value (=1ILB-Sub) of one of sub interleave blocks is set.
240f
240g
Simultaneous reproduction of main and sub interleave blocks instructed?
NO
YES
240h
2nd buffer amount ≤ 1/2 ILB-Sub
NO
240i
240j
YES
Data in sub interleave block is read and transferred to 2nd buffer.
Transfer of data in sub interleave block to 2nd buffer is stopped.
Ordinary reproduction
240k

FIG. 28

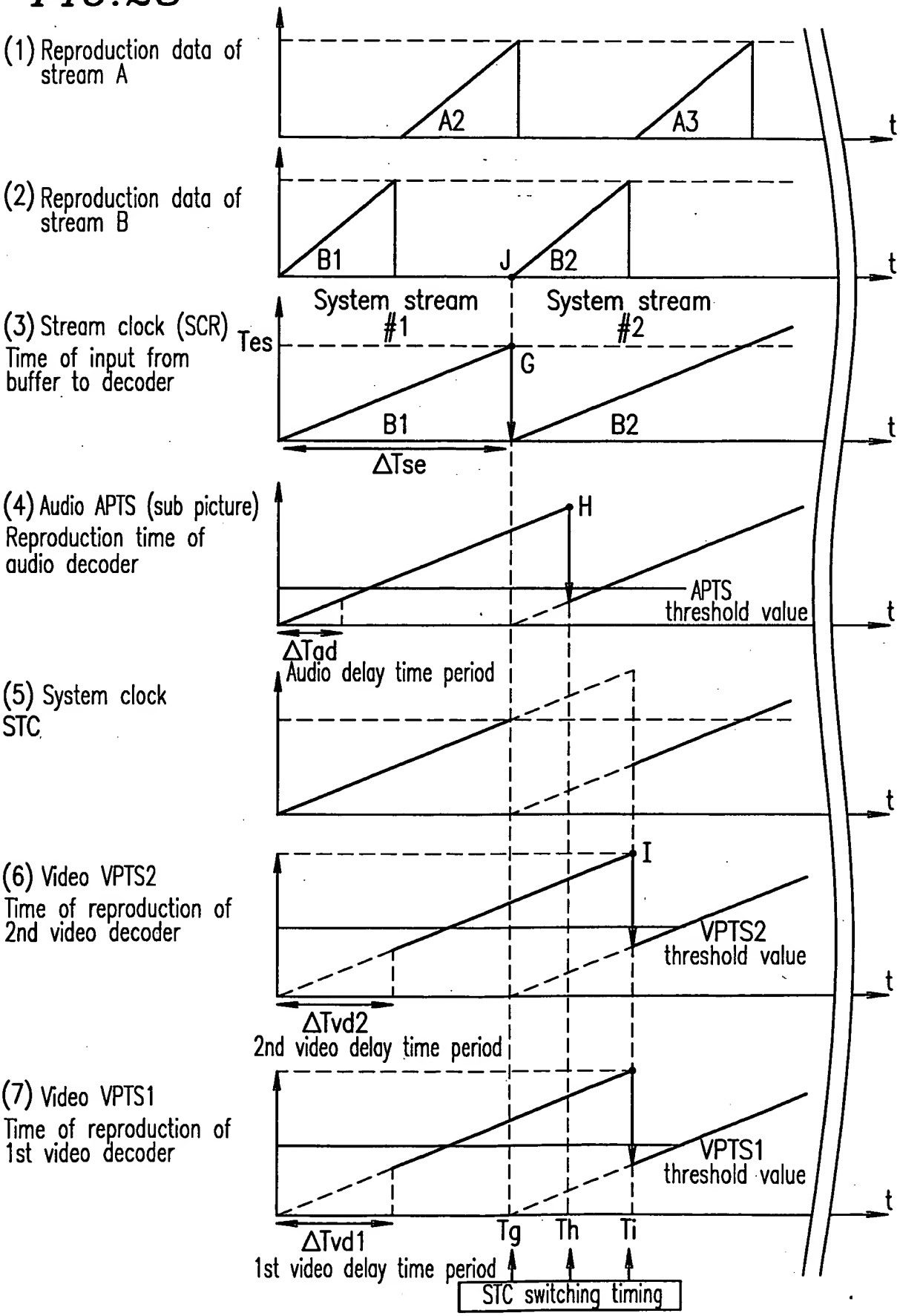
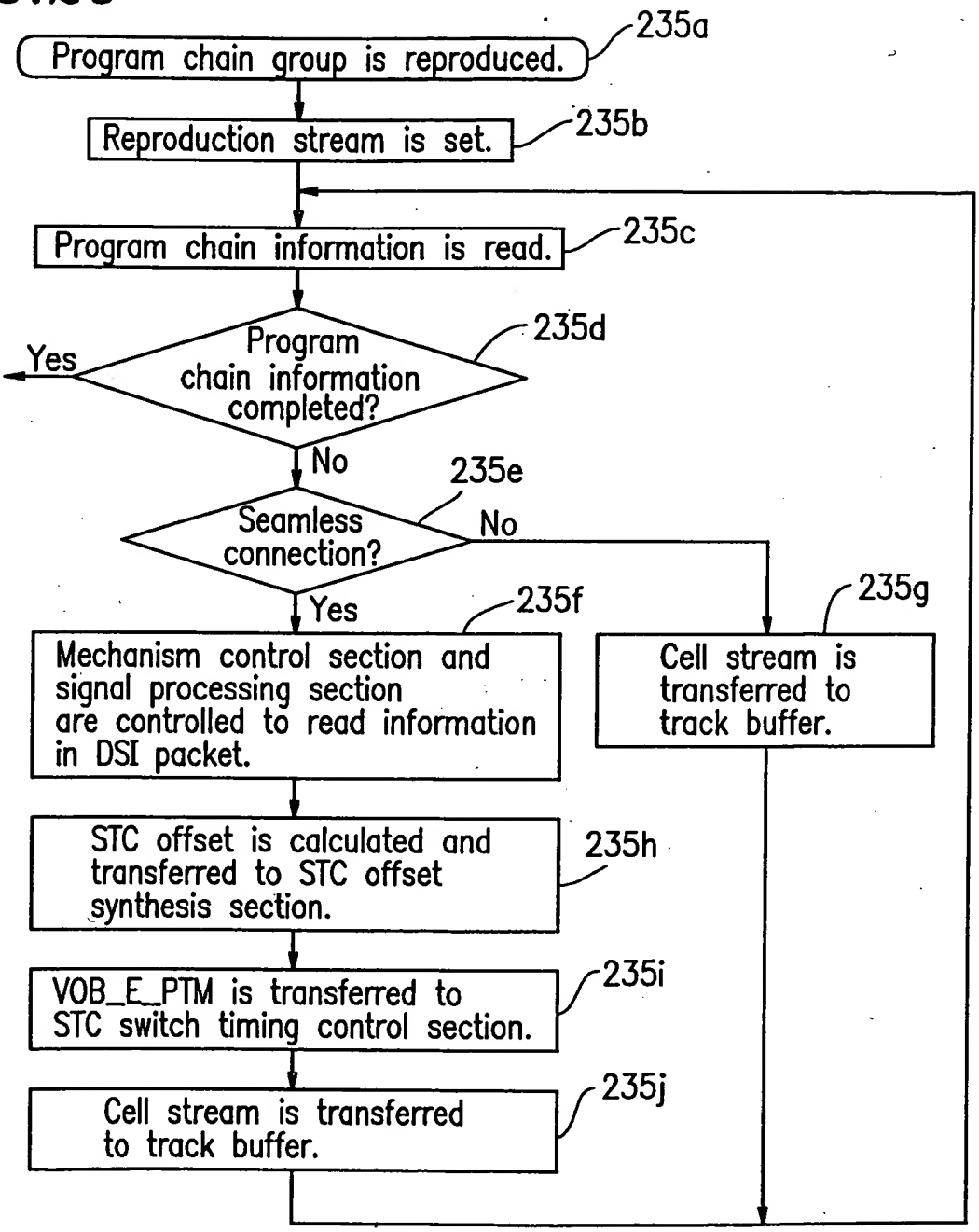

(1) Reproduction data of stream A
A2
A3
t
(2) Reproduction data of stream B
B1
J
B2
t
(3) Stream clock (SCR)
Time of input from buffer to decoder
System stream #1
System stream #2
Tes
G
B1
B2
t
ΔTse
(4) Audio APTS (sub picture)
Reproduction time of audio decoder
H
APTS threshold value
t
ΔTad
Audio delay time period
(5) System clock STC
t
(6) Video VPTS2
Time of reproduction of 2nd video decoder
I
VPTS2 threshold value
t
ΔTvd2
2nd video delay time period
(7) Video VPTS1
Time of reproduction of 1st video decoder
VPTS1 threshold value
t
Tg
Th
Ti
ΔTvd1
1st video delay time period
STC switching timing

FIG.29


Program chain group is reproduced.
235a
Reproduction stream is set.
235b
Program chain information is read.
235c
Program chain information completed?
235d
Yes
No
Seamless connection?
235e
No
Yes
Mechanism control section and signal processing section are controlled to read information in DSI packet.
235f
Cell stream is transferred to track buffer.
235g
STC offset is calculated and transferred to STC offset synthesis section.
235h
VOB_E_PTM is transferred to STC switch timing control section.
235i
Cell stream is transferred to track buffer.
235j

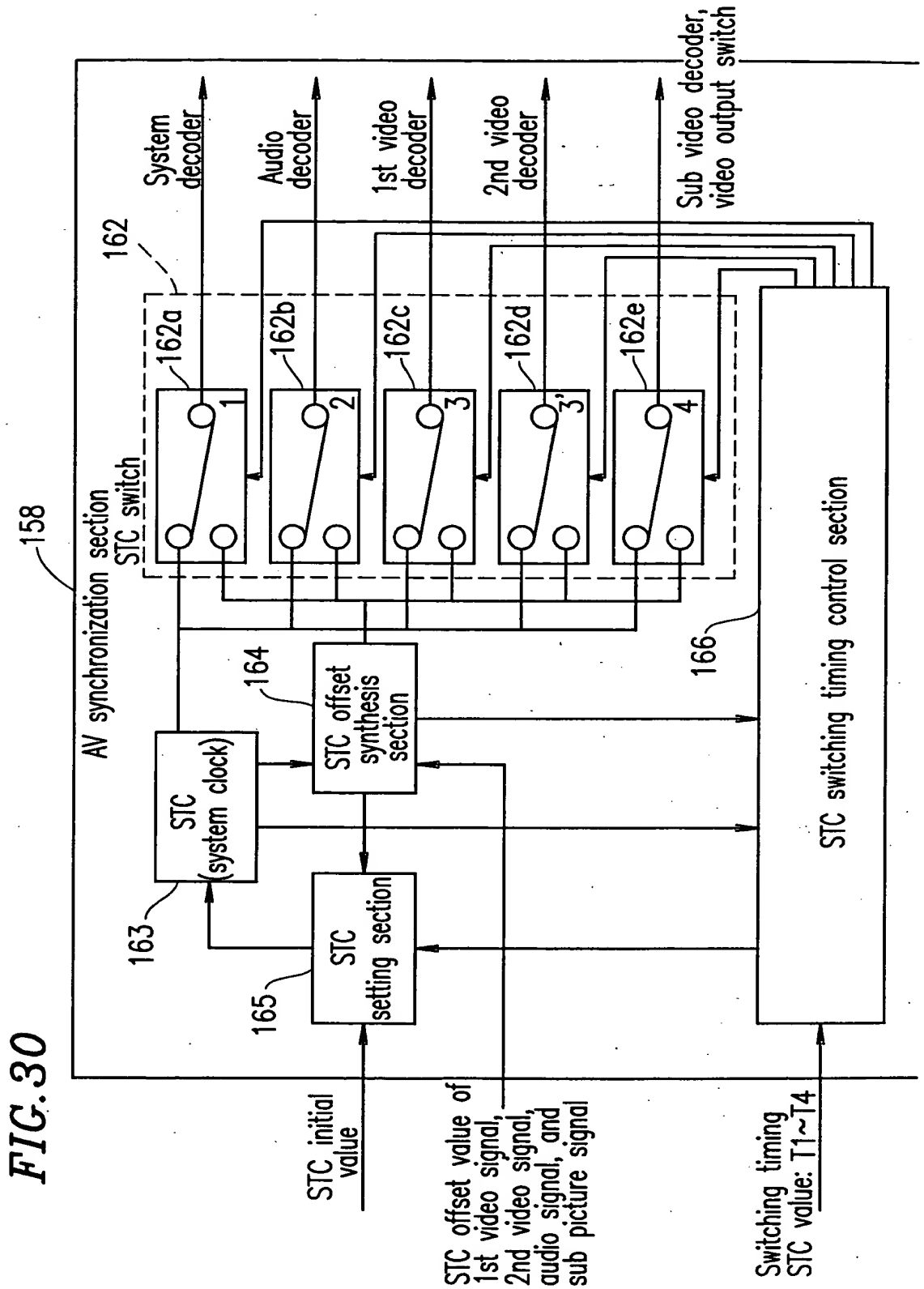

158
AV synchronization section
STC switch
162
162a
162b
162c
162d
162e
1
2
3
3'
4
System decoder
Audio decoder
1st video decoder
2nd video decoder
Sub video decoder, video output switch
164
STC offset synthesis section
166
STC switching timing control section
STC (system clock)
163
STC setting section
165
STC initial value
STC offset value of 1st video signal, 2nd video signal, audio signal, and sub picture signal
Switching timing STC value: T1~T4

FIG. 30

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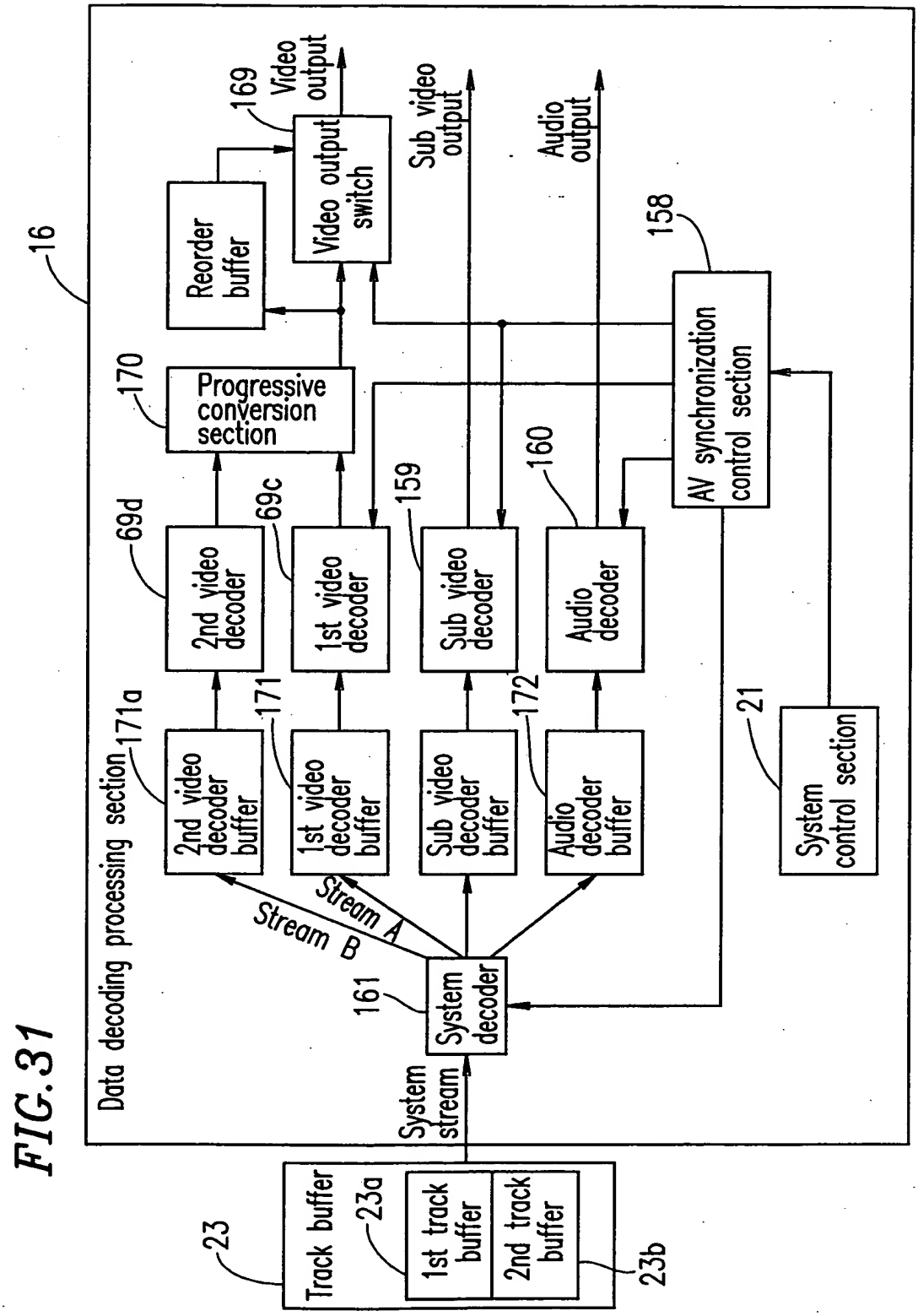



FIG. 31

*FIG. 32*

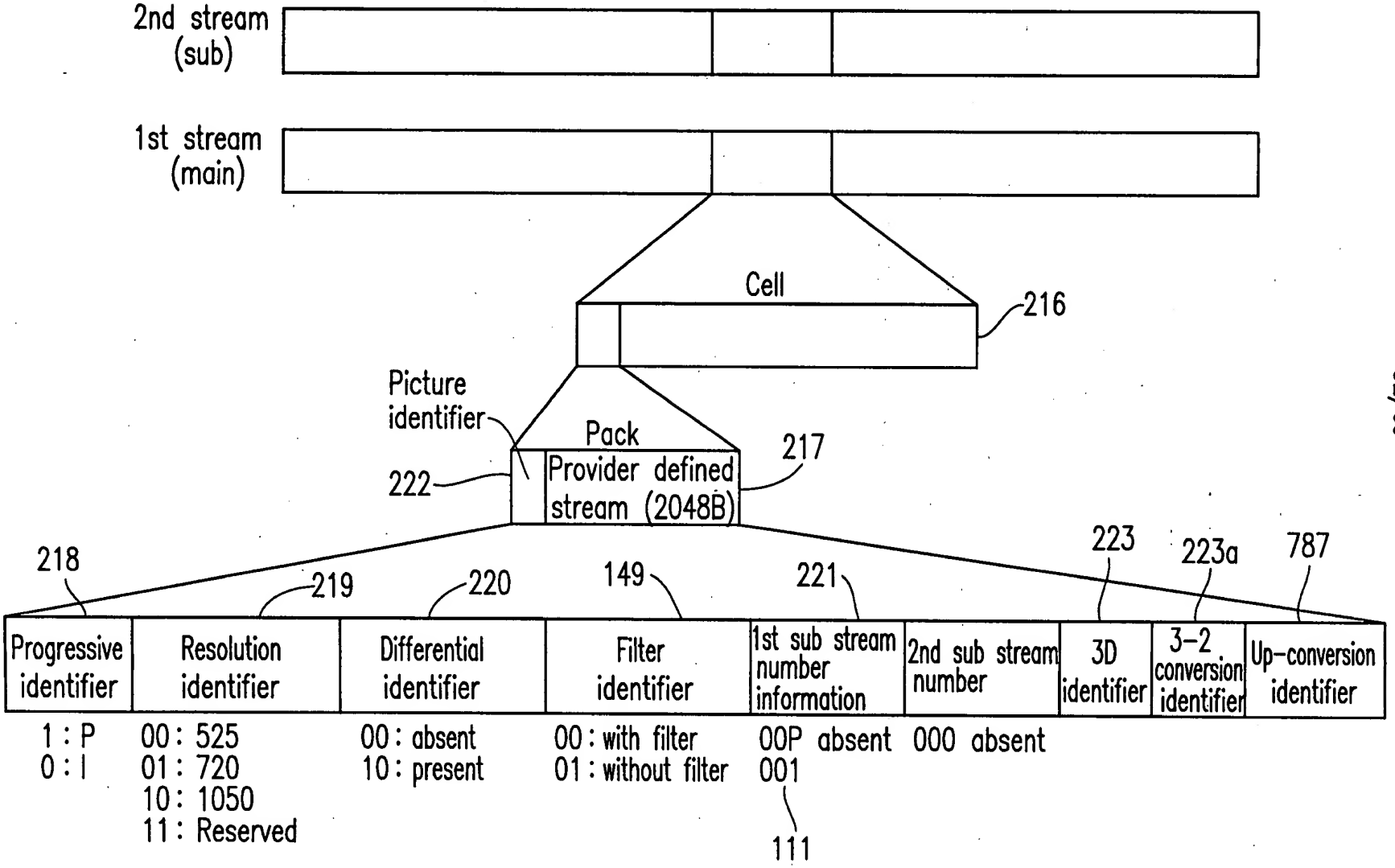

2nd stream (sub)
1st stream (main)
Cell
216
Picture identifier
222
Pack
Provider defined stream (2048B)
217
218
219
220
149
221
223
223a
787
Progressive identifier
Resolution identifier
Differential identifier
Filter identifier
1st sub stream number information
2nd sub stream number
3D identifier
3-2 conversion identifier
Up-conversion identifier
1 : P
0 : I
00 : 525
01 : 720
10 : 1050
11 : Reserved
00 : absent
10 : present
00 : with filter
01 : without filter
00P absent
001
111
000 absent

*FIG. 33*

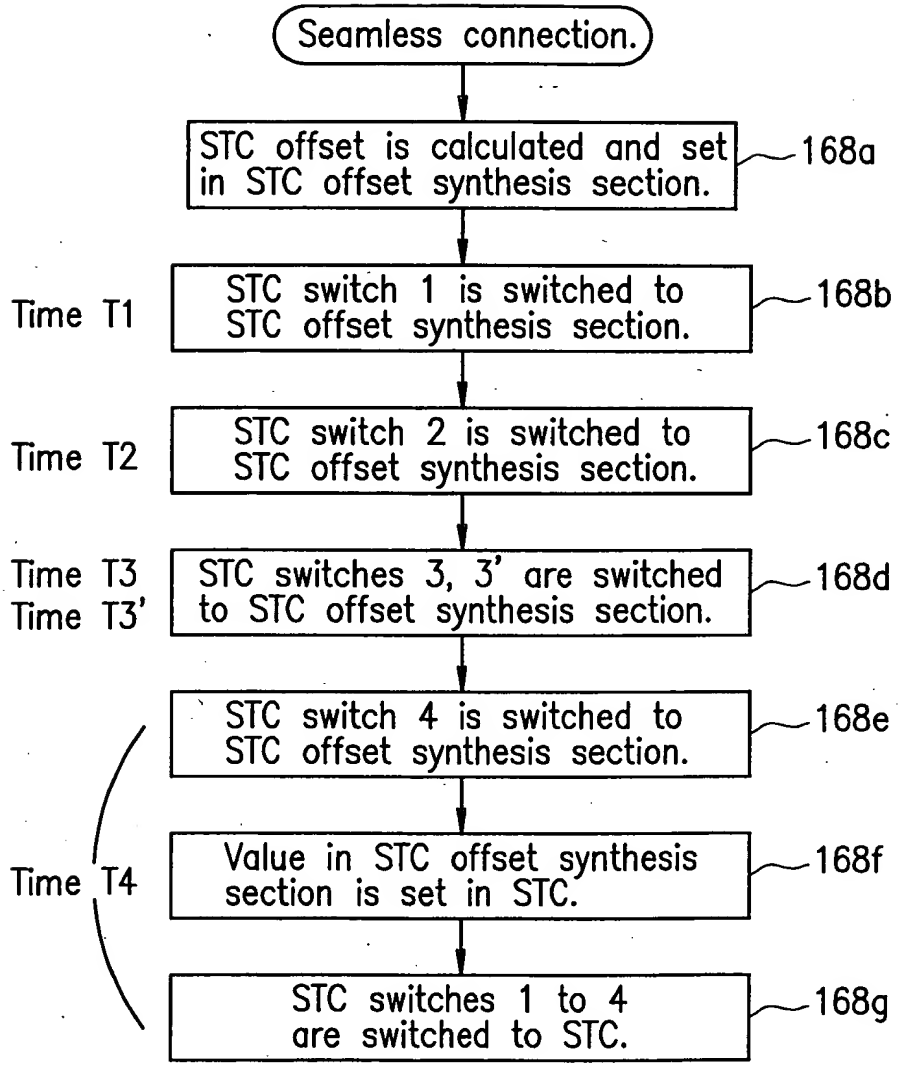
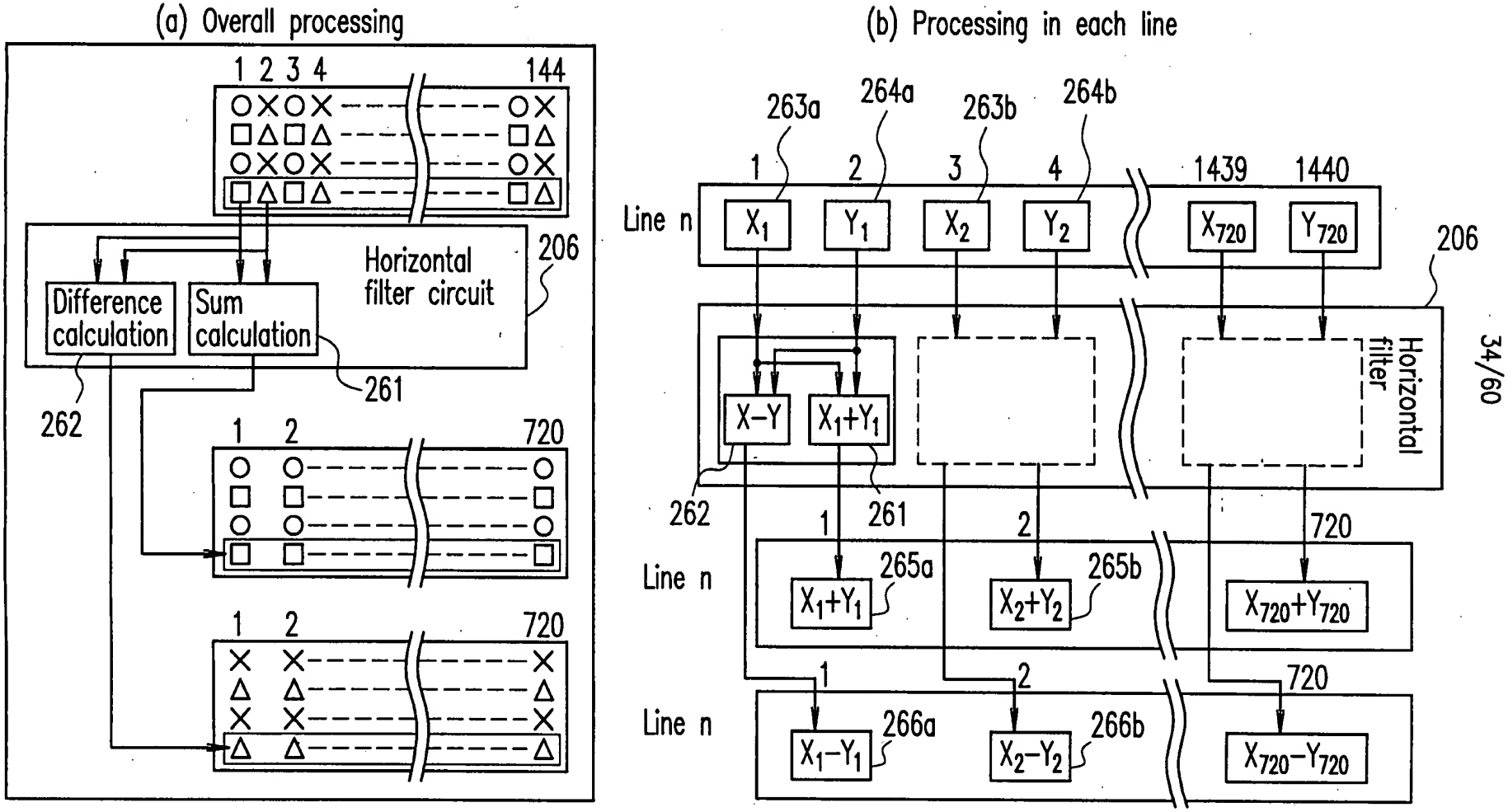

Seamless connection.
STC offset is calculated and set in STC offset synthesis section.
168a
Time T1
STC switch 1 is switched to STC offset synthesis section.
168b
Time T2
STC switch 2 is switched to STC offset synthesis section.
168c
Time T3
Time T3'
STC switches 3, 3' are switched to STC offset synthesis section.
168d
STC switch 4 is switched to STC offset synthesis section.
168e
Time T4
Value in STC offset synthesis section is set in STC.
168f
STC switches 1 to 4 are switched to STC.
168g

FIG.34


(a) Overall processing
1 2 3 4
144
Horizontal filter circuit
206
Difference calculation
Sum calculation
261
262
1 2
720
1 2
720
(b) Processing in each line
263a
264a
263b
264b
1
2
3
4
1439
1440
Line n
X1
Y1
X2
Y2
X720
Y720
206
Horizontal filter
X-Y
X1+Y1
262
1
261
2
720
Line n
265a
265b
X1+Y1
X2+Y2
X720+Y720
1
2
720
Line n
266a
266b
X1-Y1
X2-Y2
X720-Y720

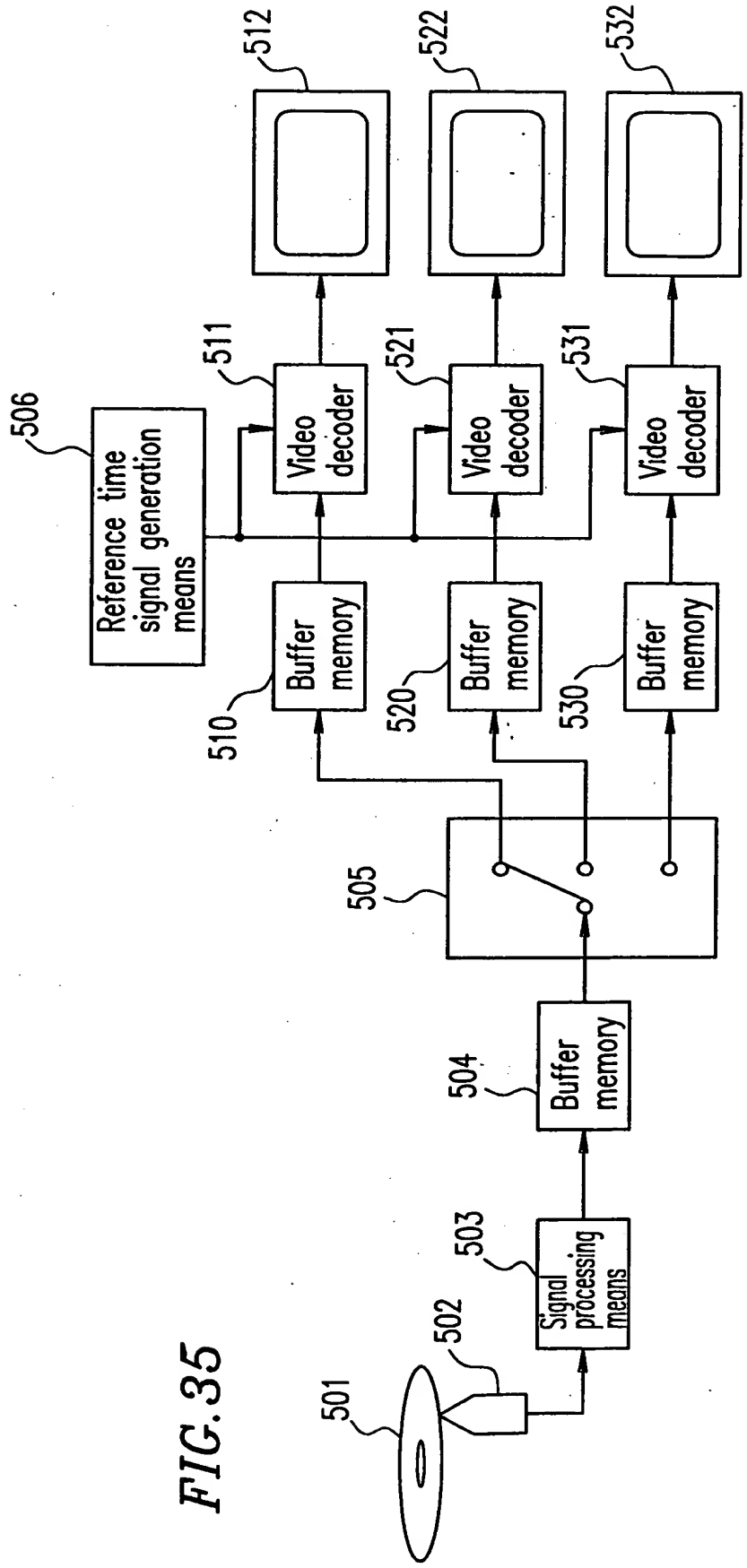

501
502
503
Signal processing means
504
Buffer memory
505
510
Buffer memory
520
Buffer memory
530
Buffer memory
506
Reference time signal generation means
511
Video decoder
521
Video decoder
531
Video decoder
512
522
532

FIG.35

*FIG. 36*

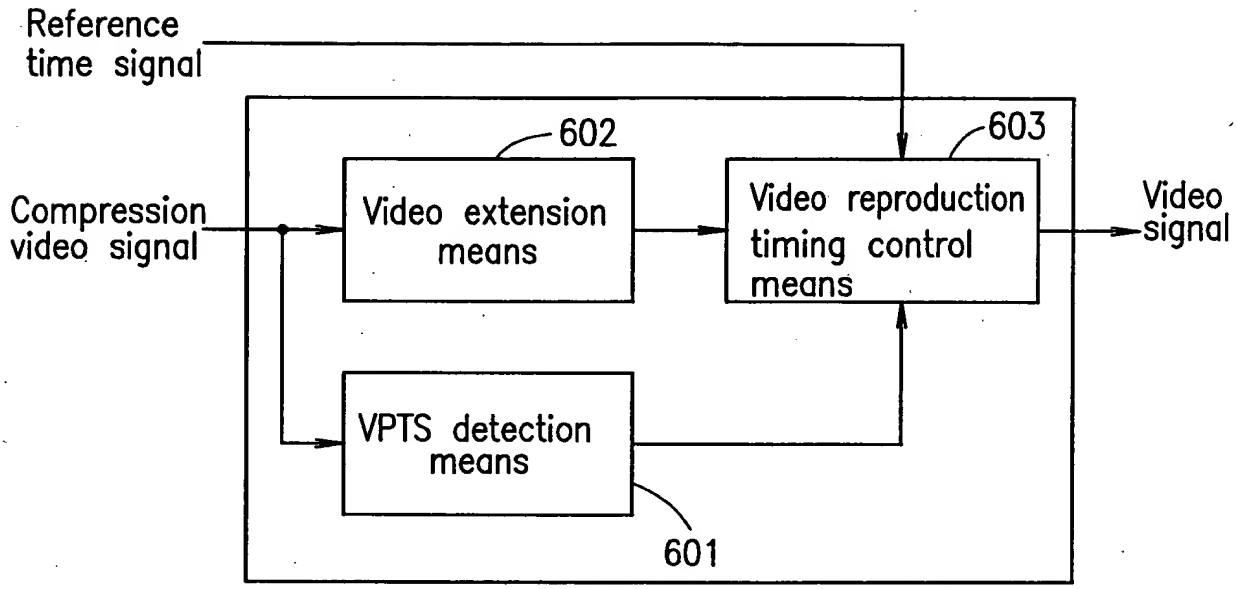

Reference time signal
602
603
Compression video signal
Video extension means
Video reproduction timing control means
Video signal
VPTS detection means
601

FIG.37

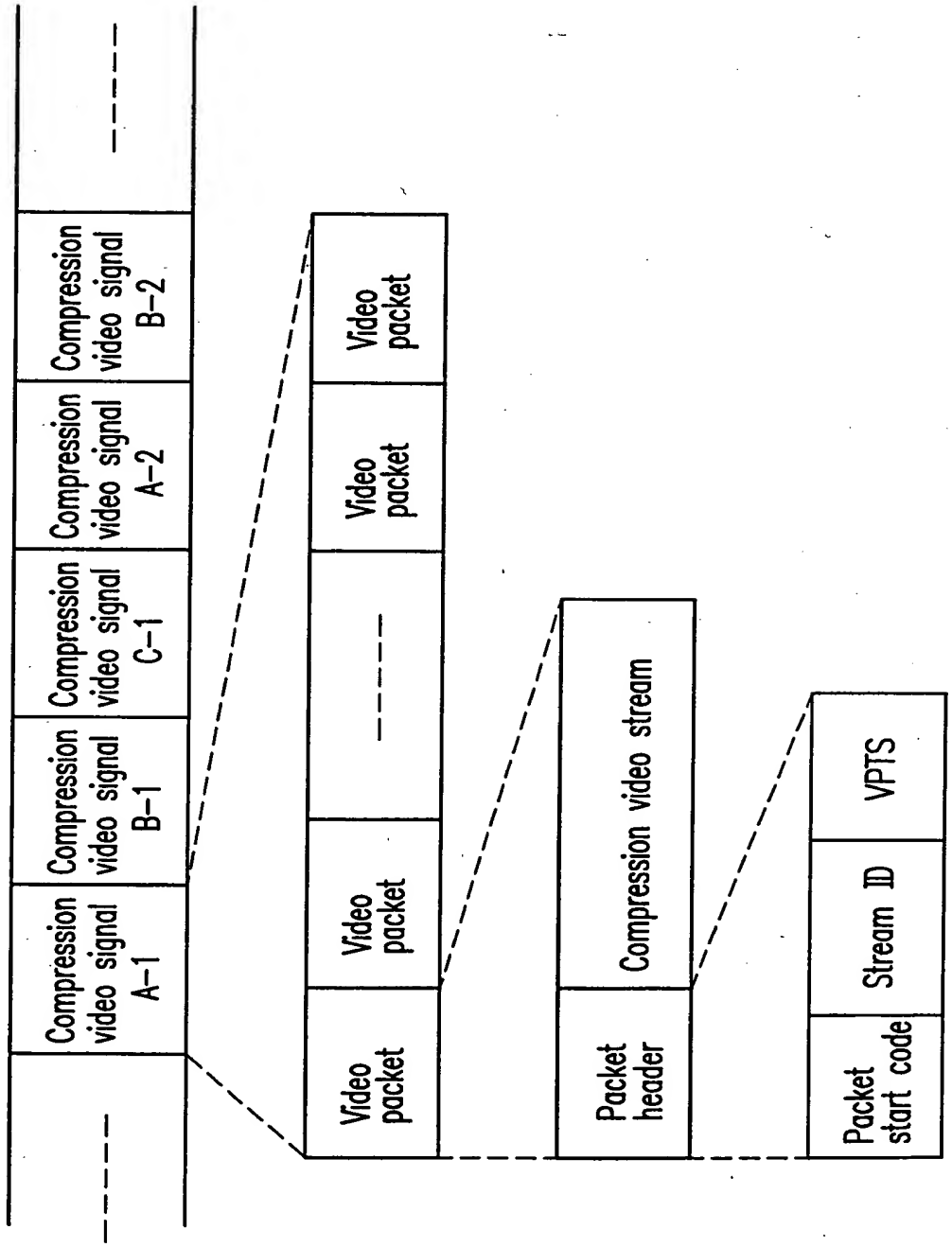
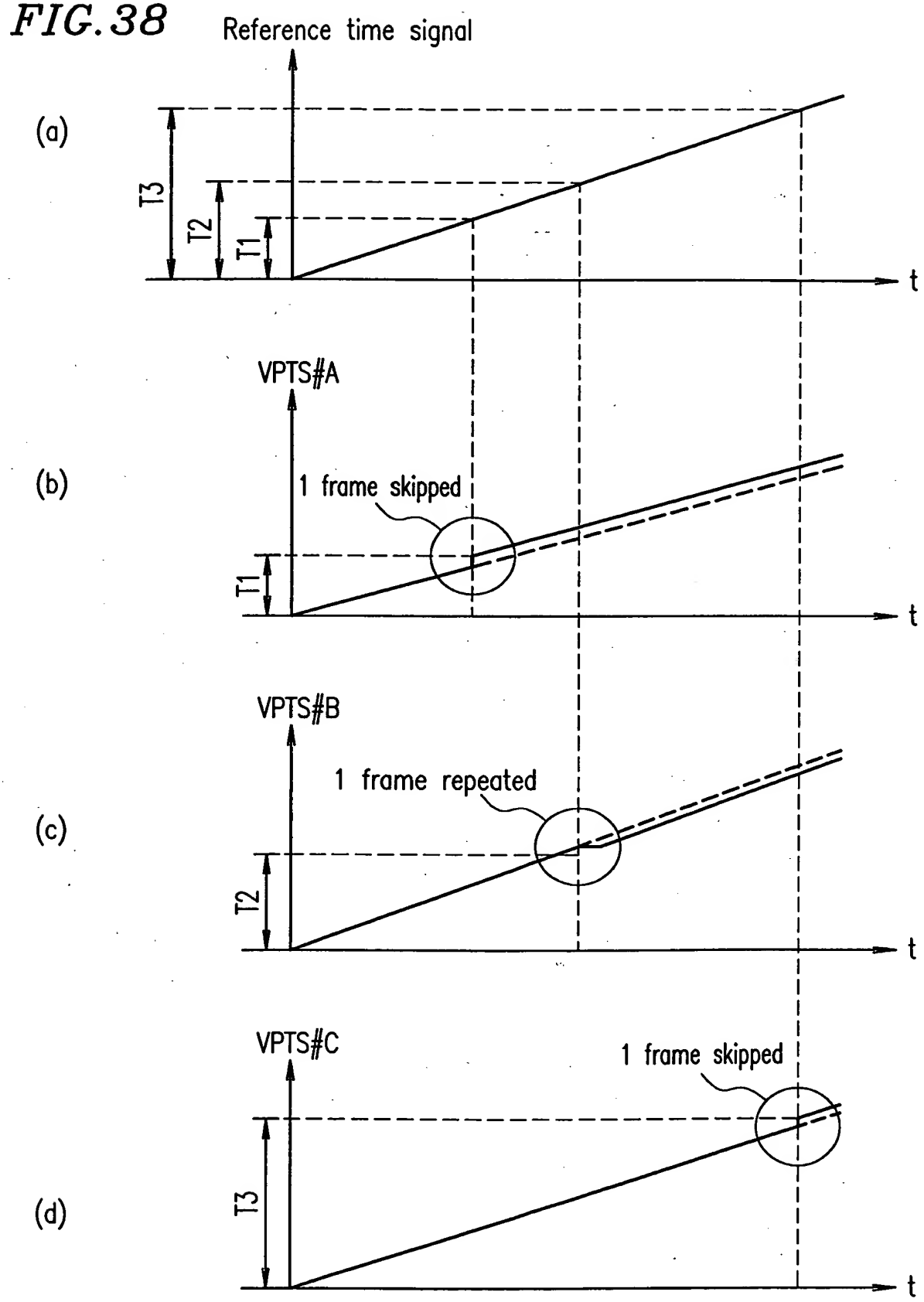

Compression video signal A-1
Compression video signal B-1
Compression video signal C-1
Compression video signal A-2
Compression video signal B-2
Video packet
Video packet
Video packet
Video packet
Compression video stream
Packet header
Packet start code
Stream ID
VPTS

FIG. 38


Reference time signal
(a)
T3
T2
T1
t
VPTS#A
(b)
1 frame skipped
T1
t
VPTS#B
1 frame repeated
(c)
T2
t
VPTS#C
1 frame skipped
(d)
T3
t

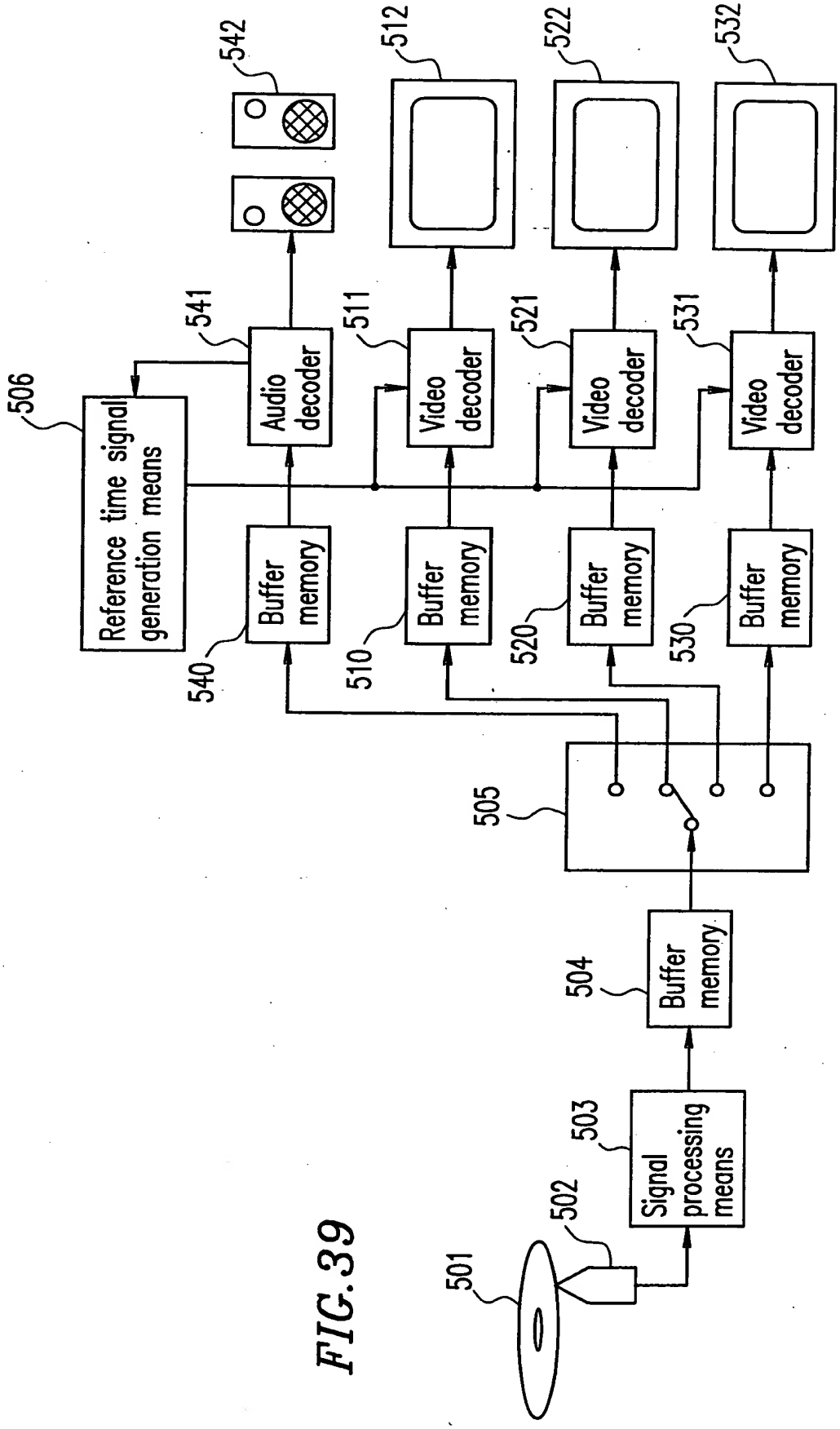
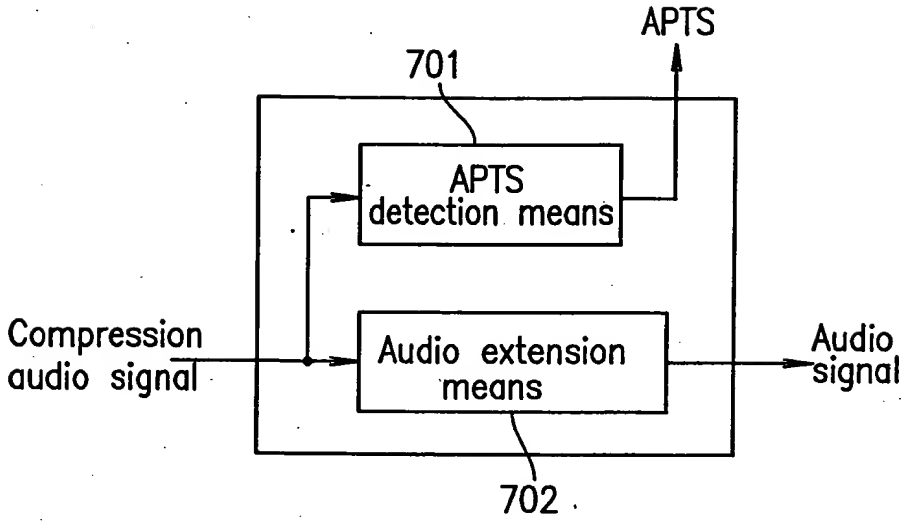

501
502
503
Signal processing means
504
Buffer memory
505
506
Reference time signal generation means
510
Buffer memory
511
Video decoder
512
520
Buffer memory
521
Video decoder
522
530
Buffer memory
531
Video decoder
532
540
Buffer memory
541
Audio decoder
542

FIG. 39

*FIG. 40*


APTS
701
APTS
detection means
Compression
audio signal
Audio extension
means
Audio
signal
702

005090 8C598A60

09/486538 41/60

*FIG.41*

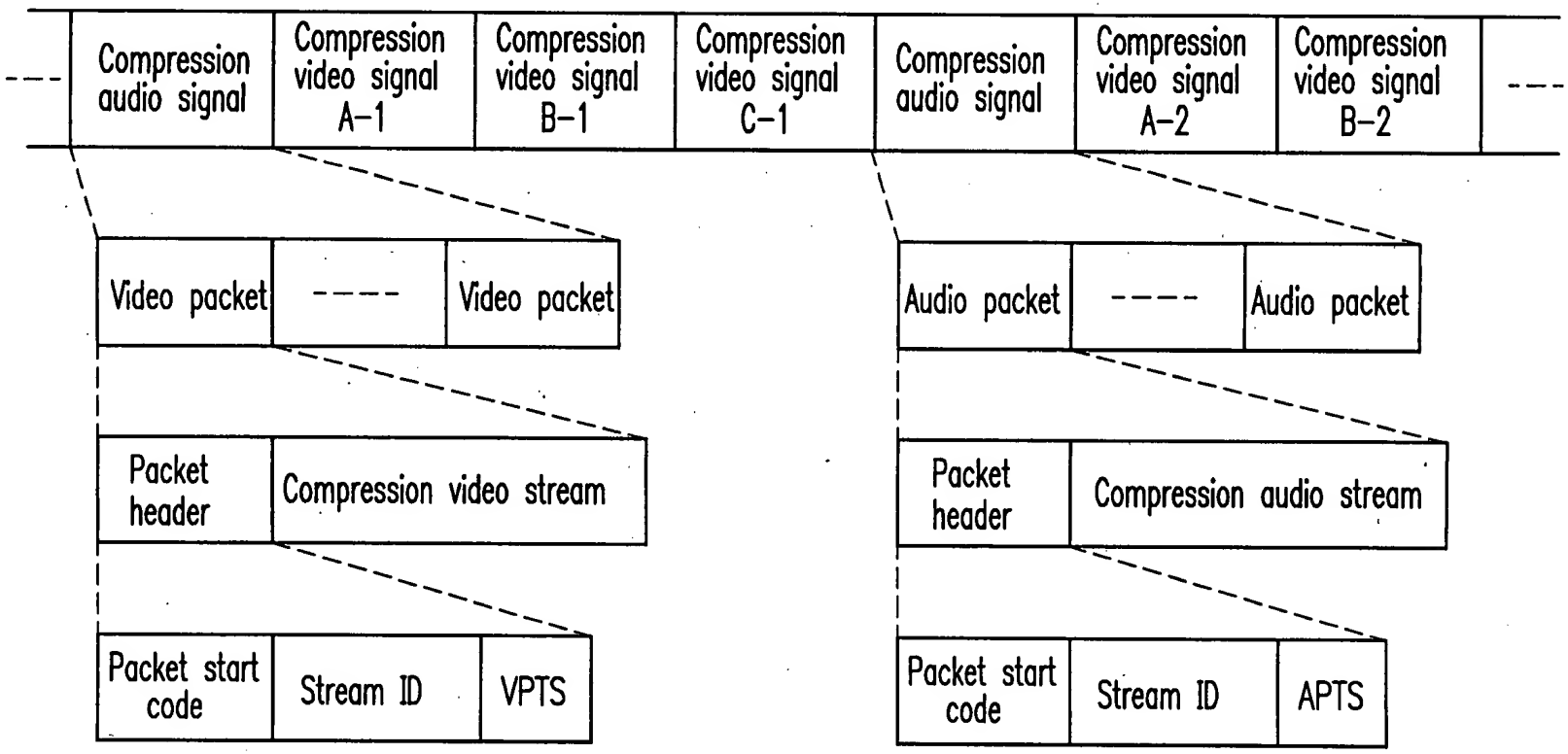
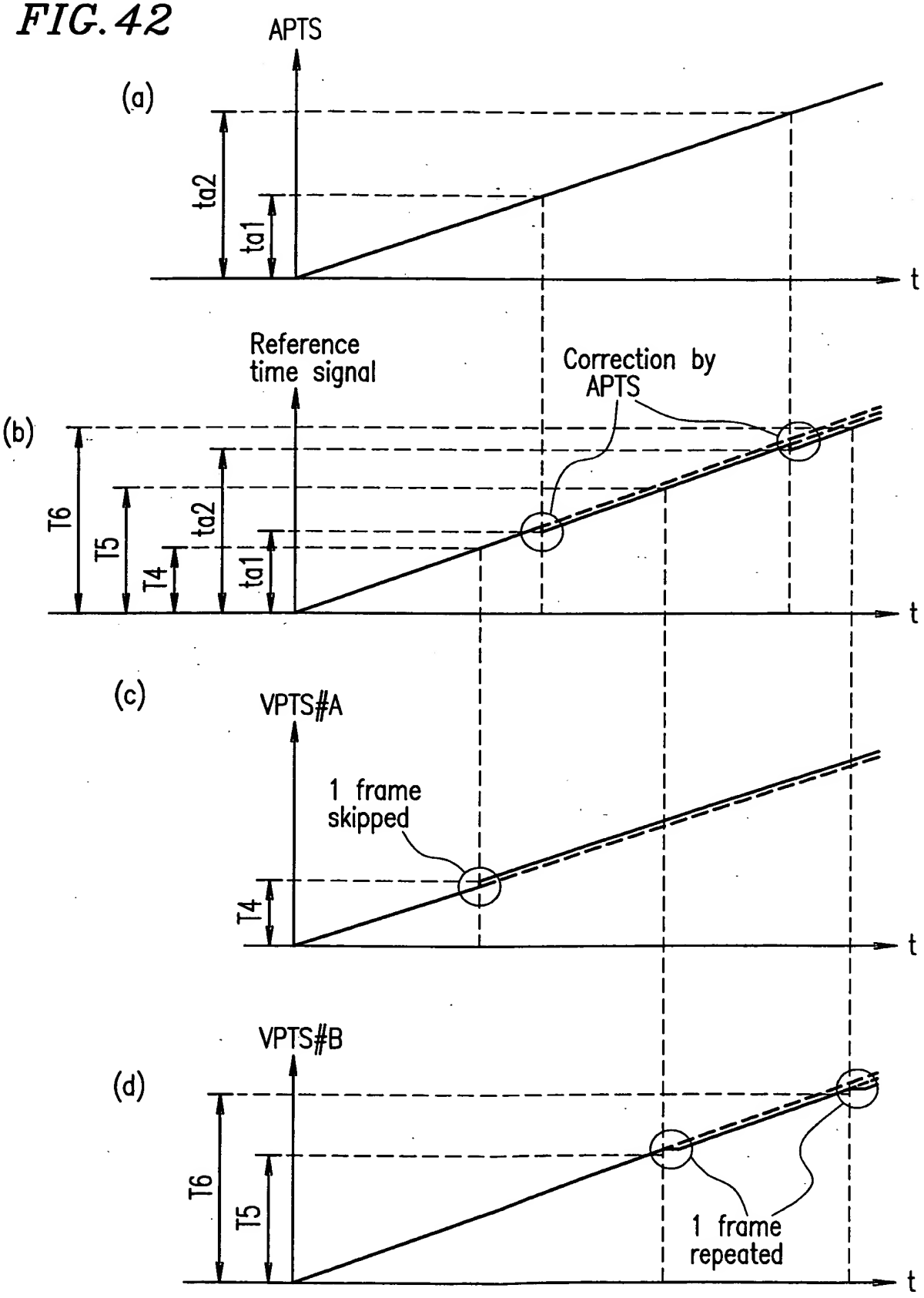


FIG. 42


APTS
(a)
ta2
ta1
t
Reference time signal
Correction by APTS
(b)
T6
T5
T4
ta2
ta1
t
(c)
VPTS#A
1 frame skipped
T4
t
VPTS#B
(d)
T6
T5
1 frame repeated
t

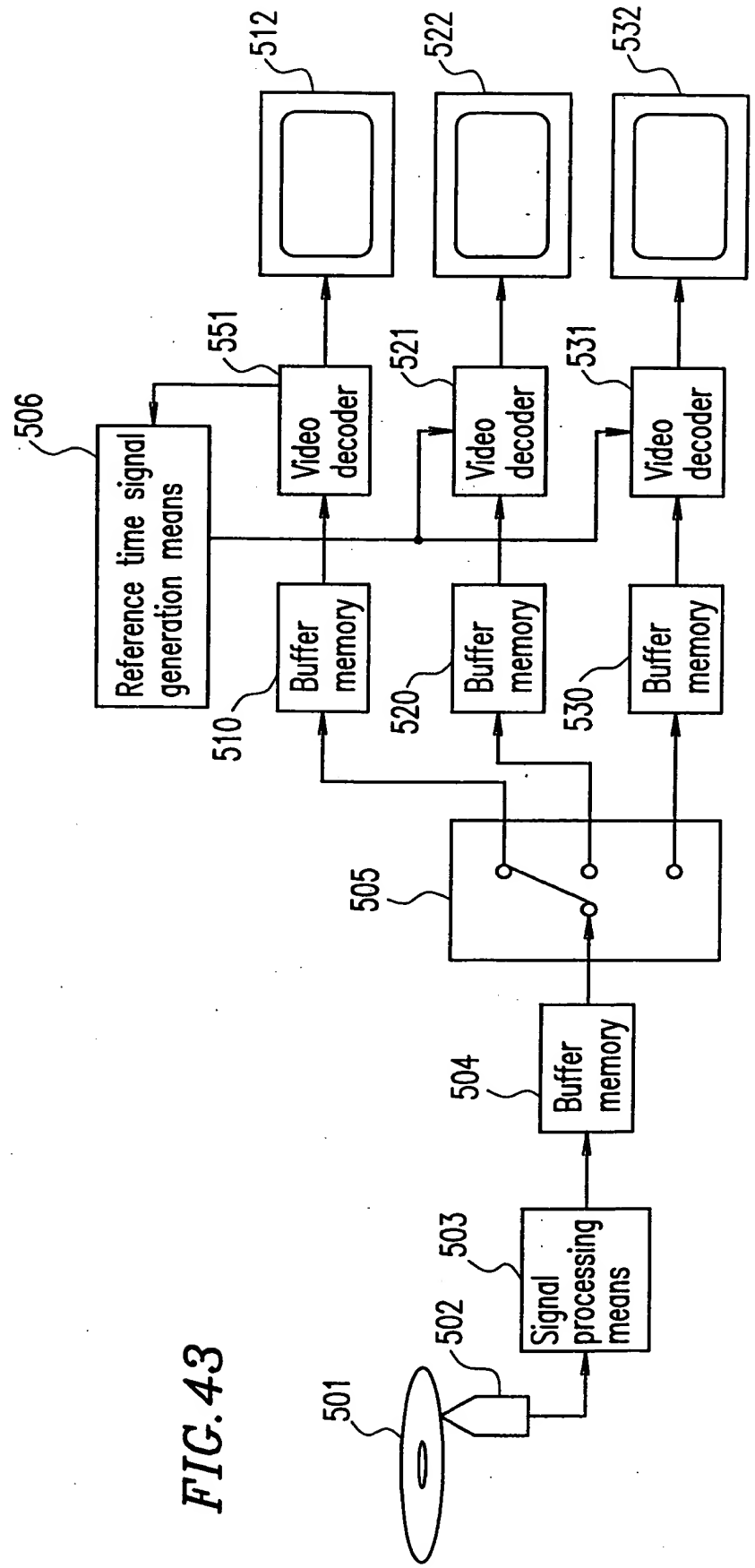

501
502
503
Signal processing means
504
Buffer memory
505
510
520
530
Buffer memory
Buffer memory
Buffer memory
506
Reference time signal generation means
551
521
531
Video decoder
Video decoder
Video decoder
512
522
532

FIG. 43

*FIG. 44*

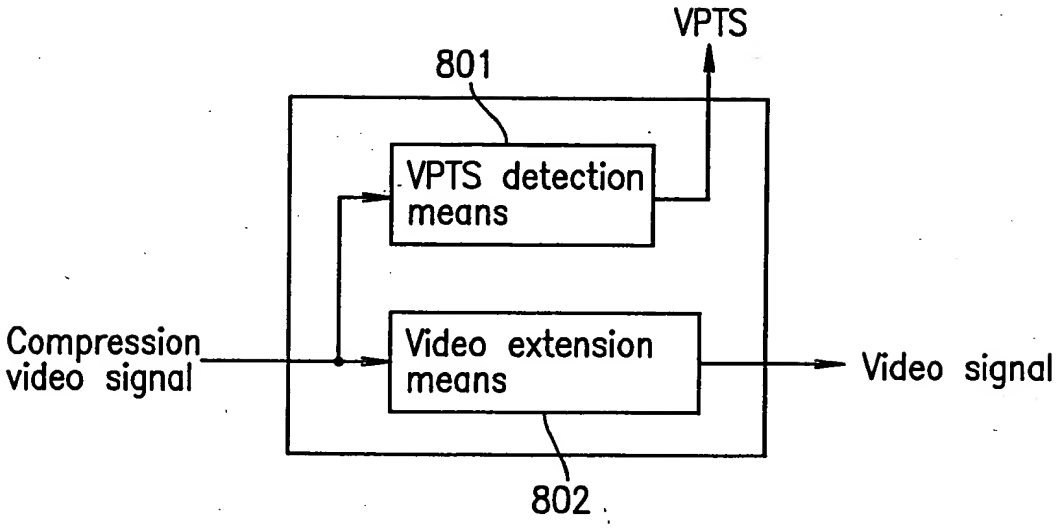
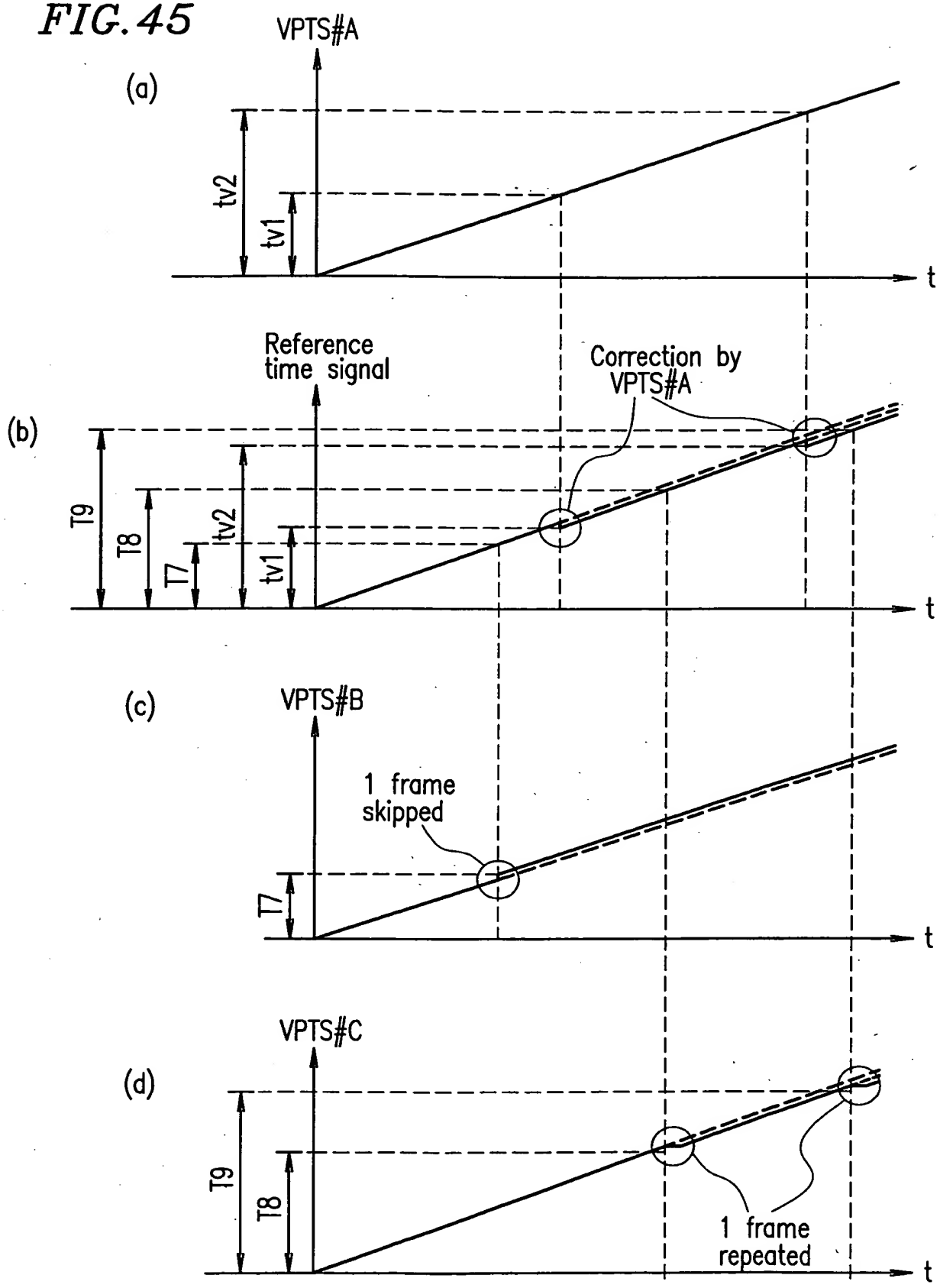

VPTS
801
VPTS detection means
Compression video signal
Video extension means
Video signal
802

FIG. 45


VPTS#A
(a)
tv2
tv1
t
Reference time signal
Correction by VPTS#A
(b)
T9
T8
T7
tv2
tv1
t
(c)
VPTS#B
1 frame skipped
T7
t
VPTS#C
(d)
T9
T8
1 frame repeated
t

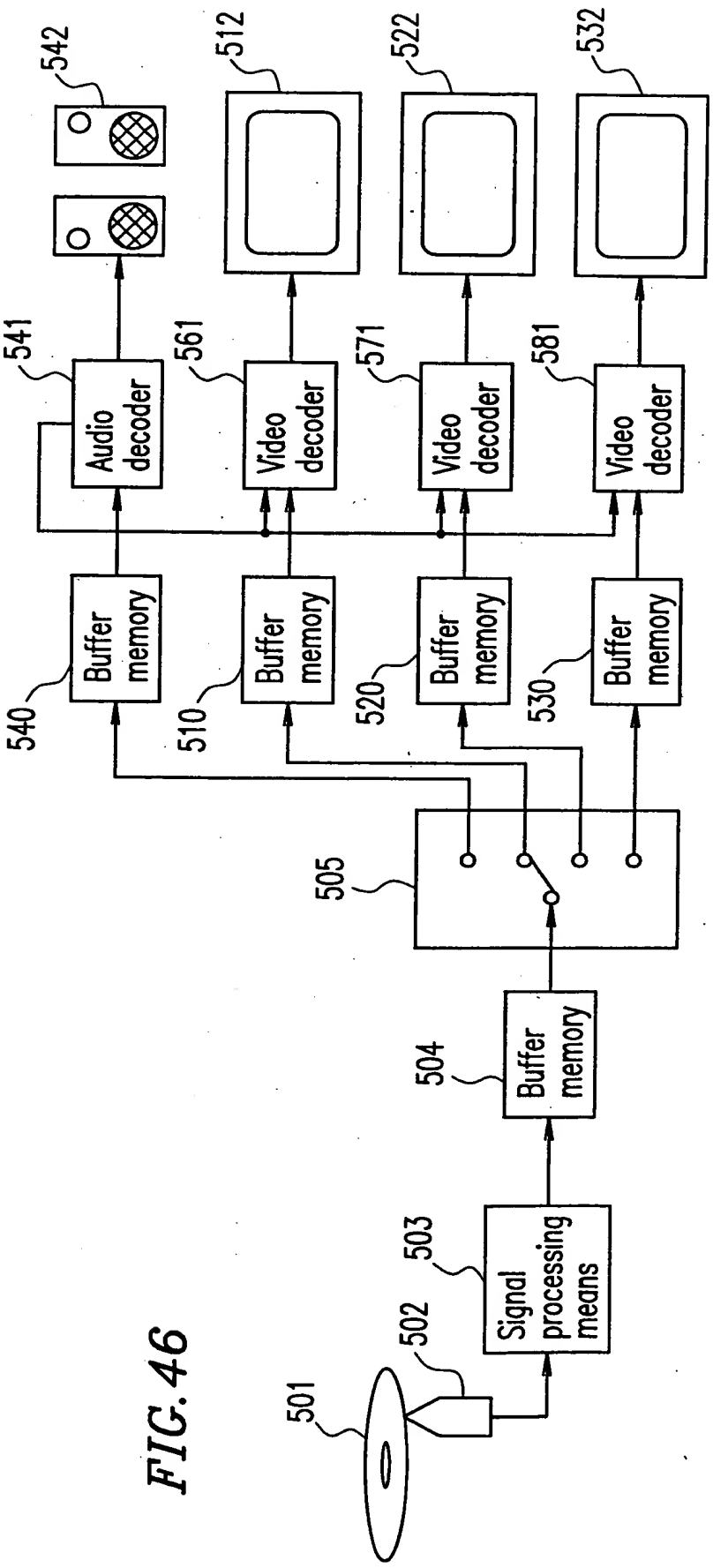

501
502
Signal processing means
503
504
Buffer memory
505
540
Buffer memory
510
Buffer memory
520
Buffer memory
530
Buffer memory
541
Audio decoder
561
Video decoder
571
Video decoder
581
Video decoder
542
512
522
532

FIG. 46

FIG. 47

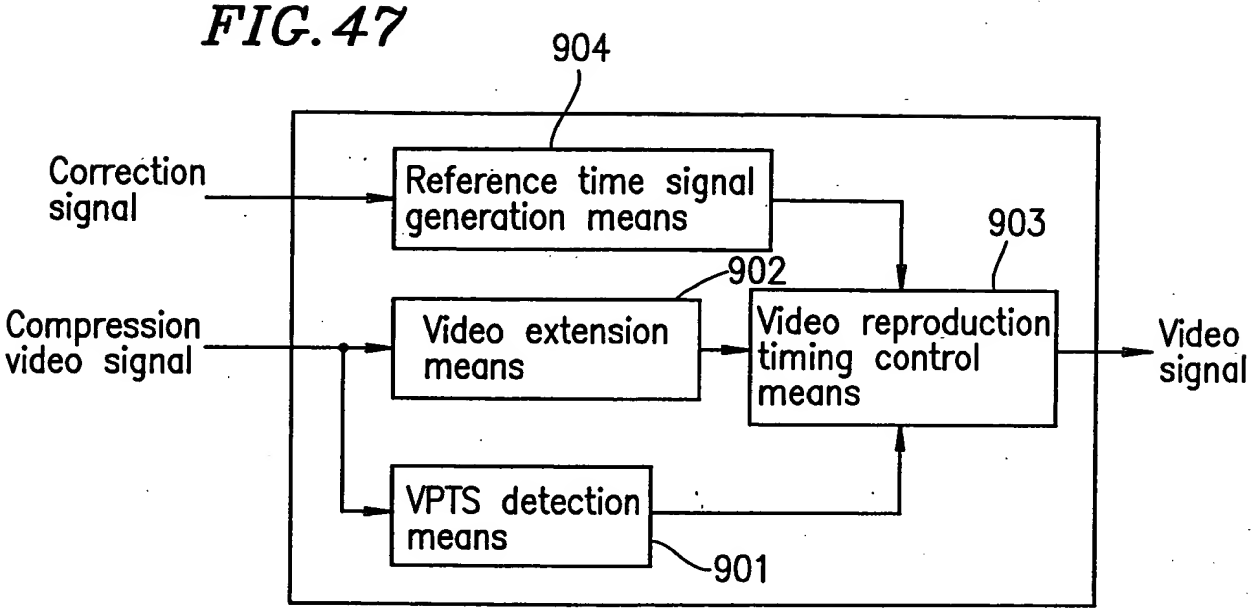

904
Correction signal
Reference time signal generation means
903
902
Compression video signal
Video extension means
Video reproduction timing control means
Video signal
VPTS detection means
901

*FIG. 48*

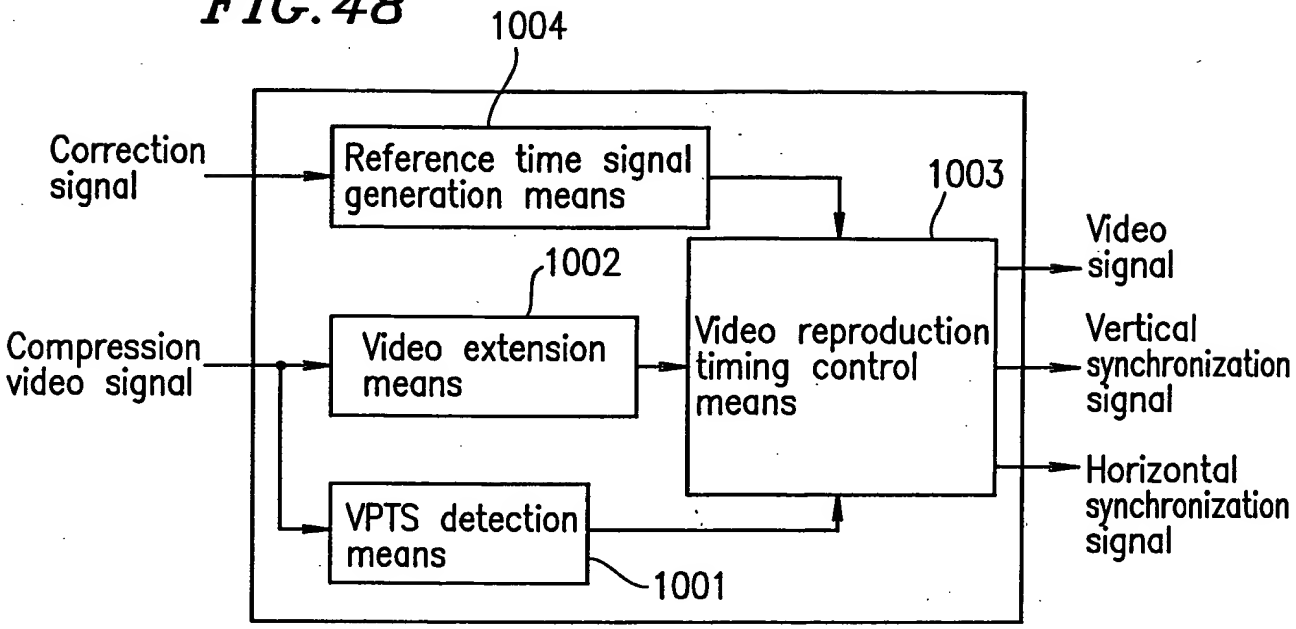
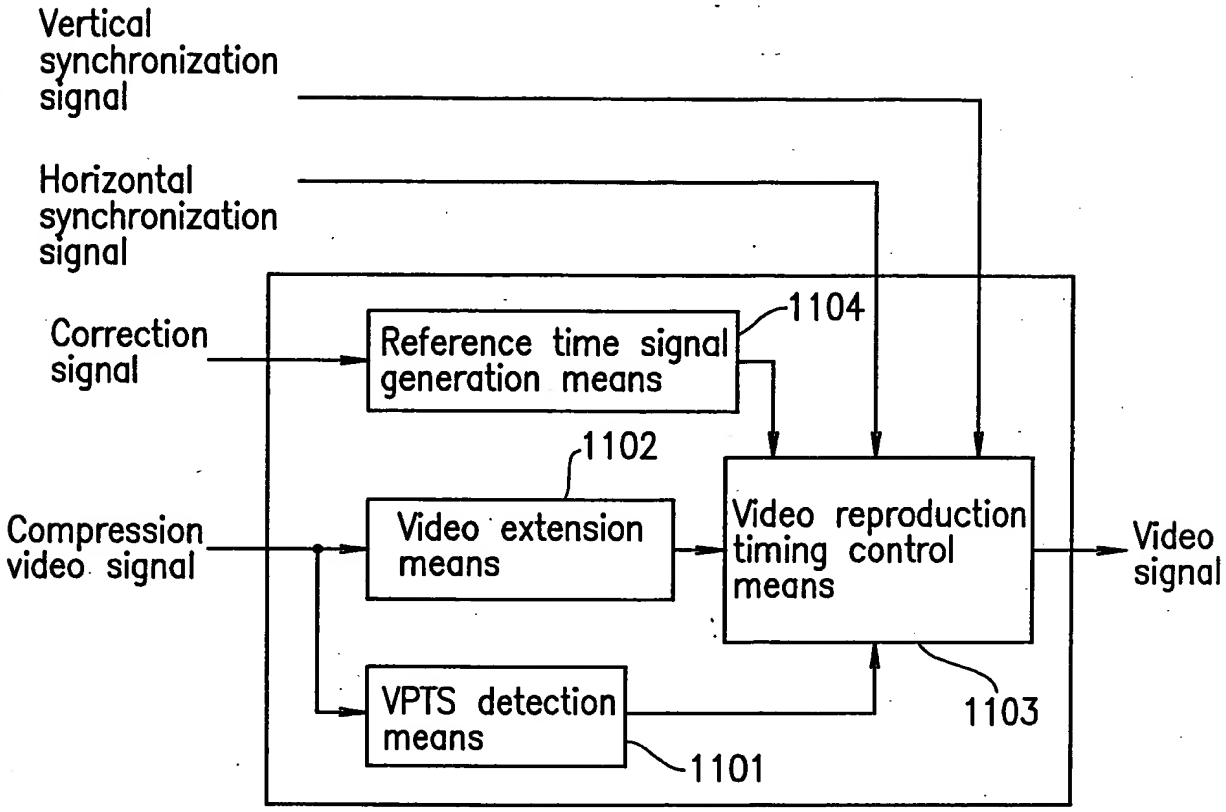

1004
Correction signal
Reference time signal generation means
1003
Video signal
1002
Compression video signal
Video extension means
Video reproduction timing control means
Vertical synchronization signal
Horizontal synchronization signal
VPTS detection means
1001

*FIG. 49*


Vertical synchronization signal
Horizontal synchronization signal
Correction signal
Reference time signal generation means
1104
1102
Compression video signal
Video extension means
Video reproduction timing control means
Video signal
VPTS detection means
1103
1101

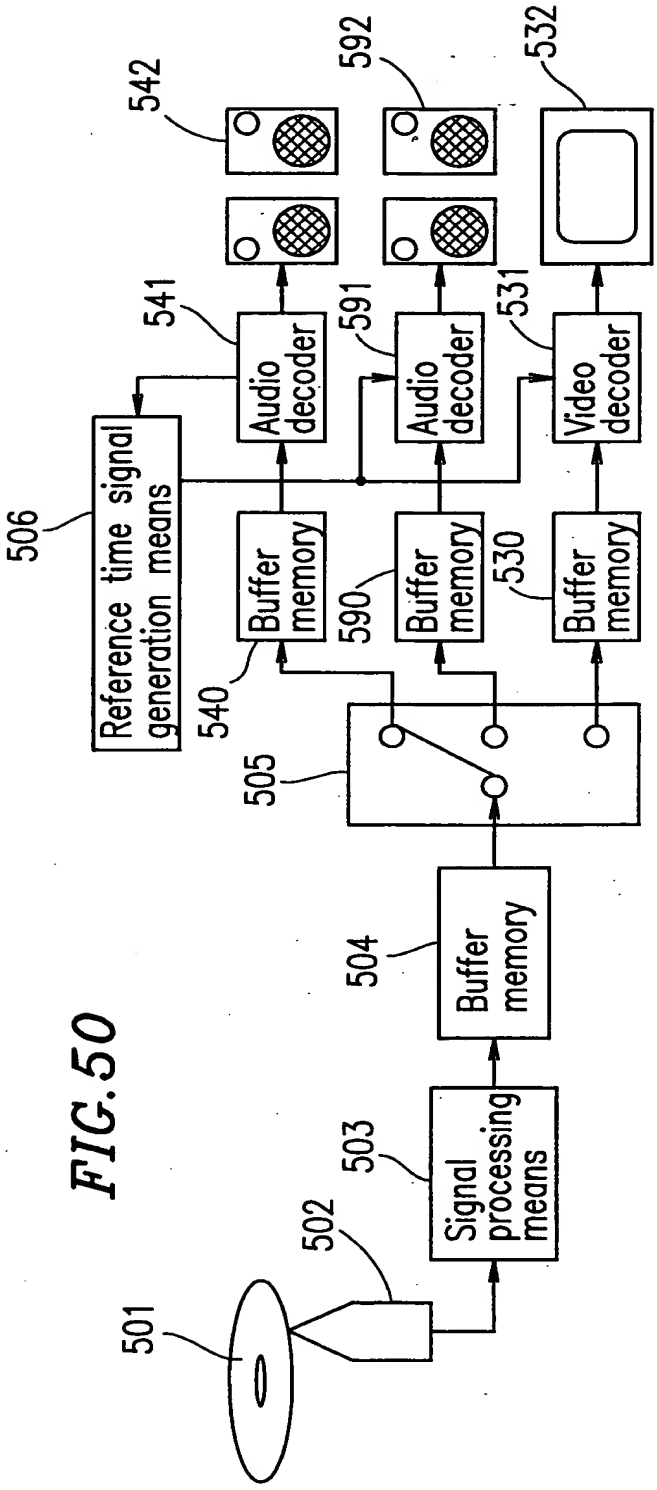
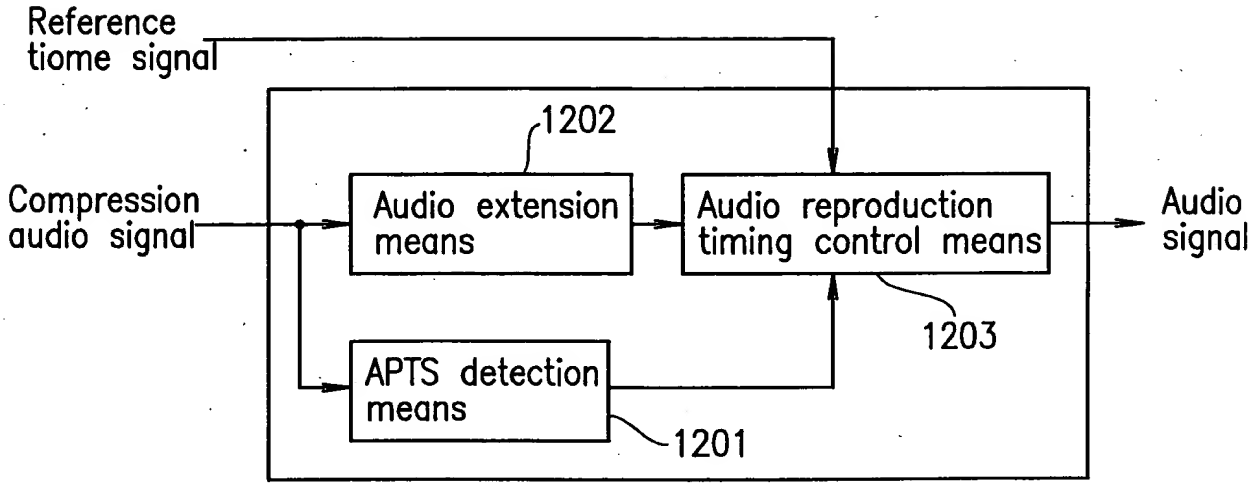

501
502
503
Signal processing means
504
Buffer memory
505
506
Reference time signal generation means
540
Buffer memory
541
Audio decoder
542
590
Buffer memory
591
Audio decoder
592
530
Buffer memory
531
Video decoder
532

FIG. 50

*FIG.51*


Reference
tiome signal
1202
Compression
audio signal
Audio extension
means
Audio reproduction
timing control means
Audio
signal
1203
APTS detection
means
1201

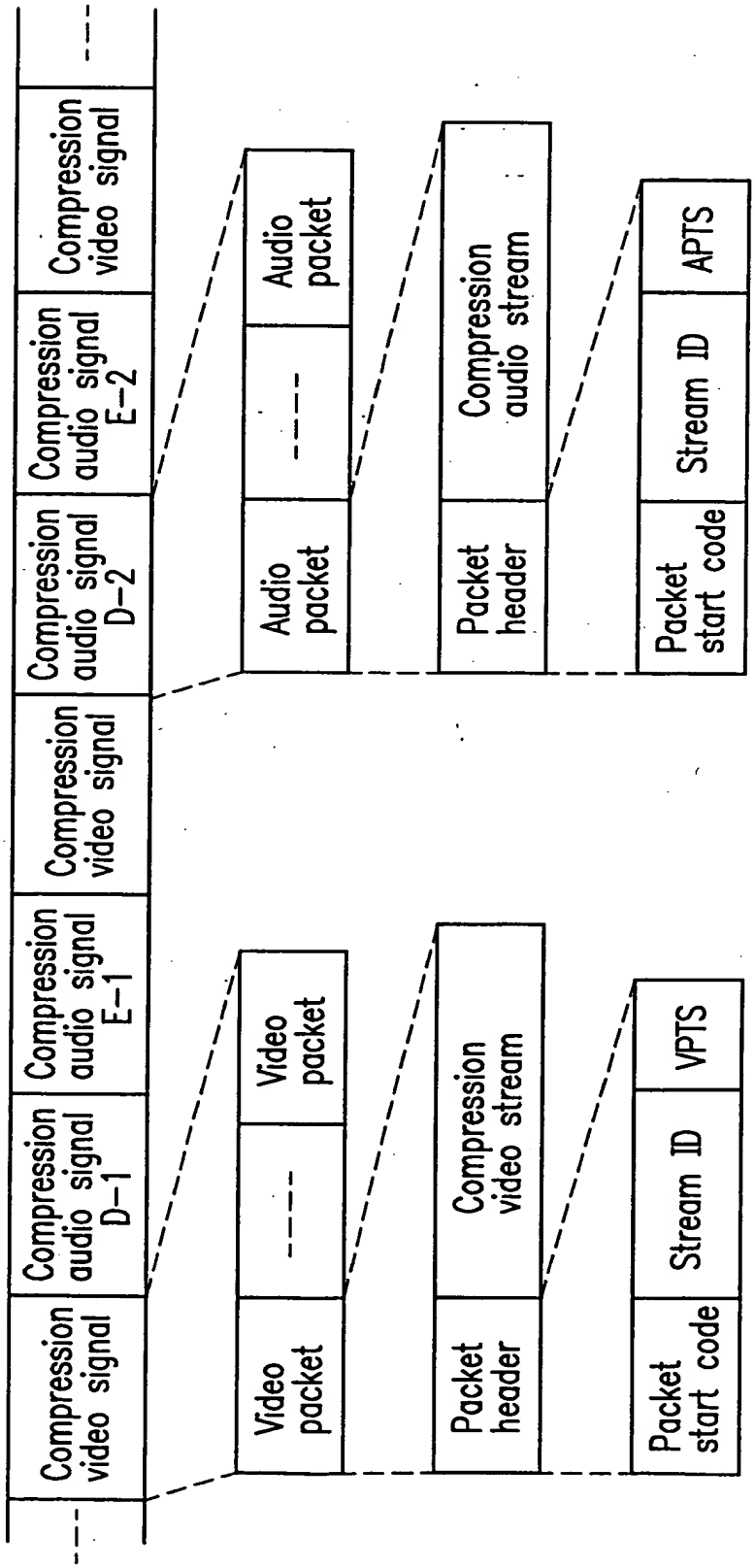

Compression video signal
Compression audio signal D-1
Compression audio signal E-1
Compression video signal
Compression audio signal D-2
Compression audio signal E-2
Compression video signal
Video packet
Audio packet
Packet header
Compression video stream
Compression audio stream
Packet start code
Stream ID
VPTS
APTS

FIG.52

FIG. 53

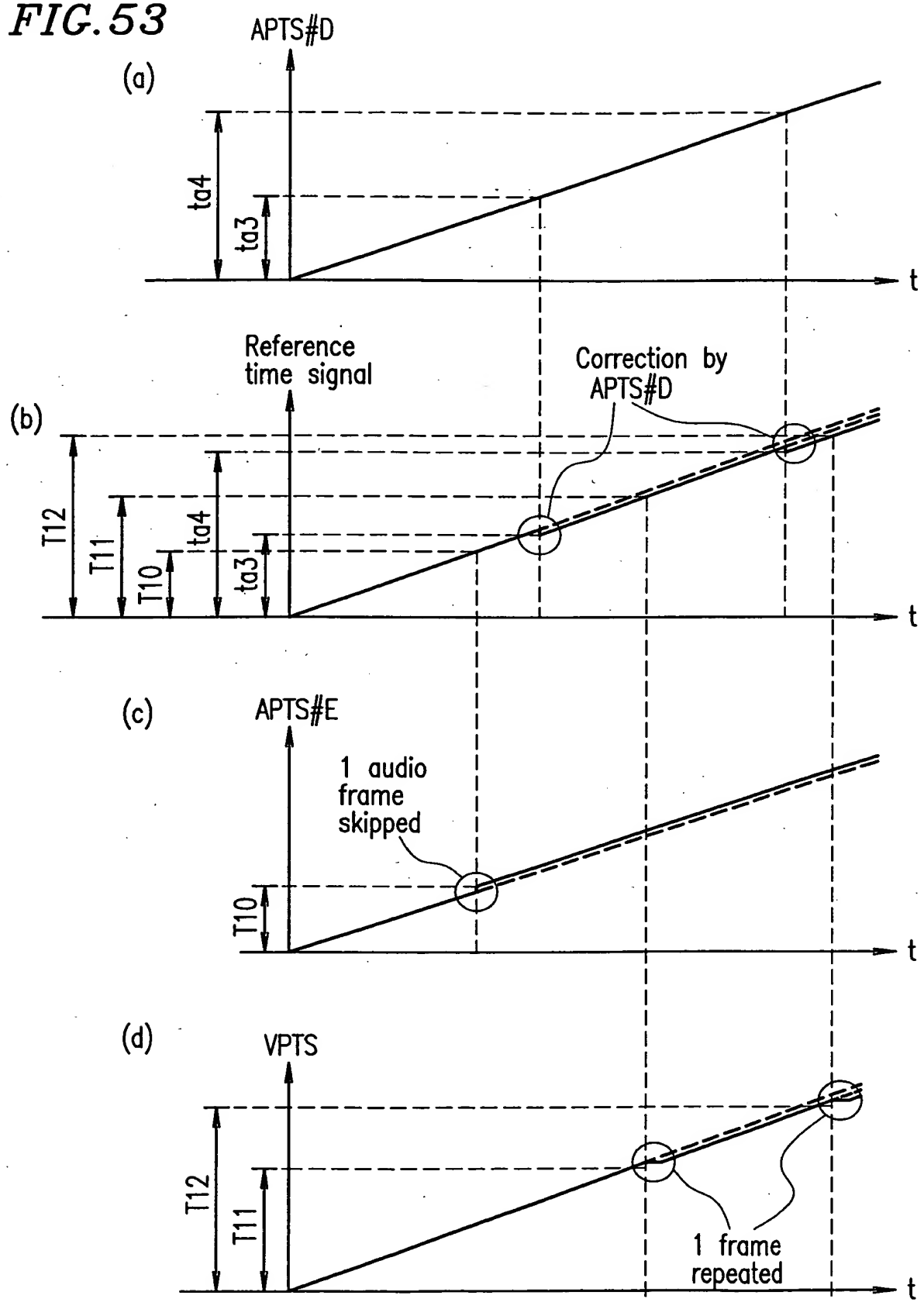

APTS#D
(a)
ta4
ta3
t
Reference time signal
Correction by APTS#D
(b)
T12
T11
T10
ta4
ta3
t
(c)
APTS#E
1 audio frame skipped
T10
t
(d)
VPTS
T12
T11
1 frame repeated
t

FIG.54

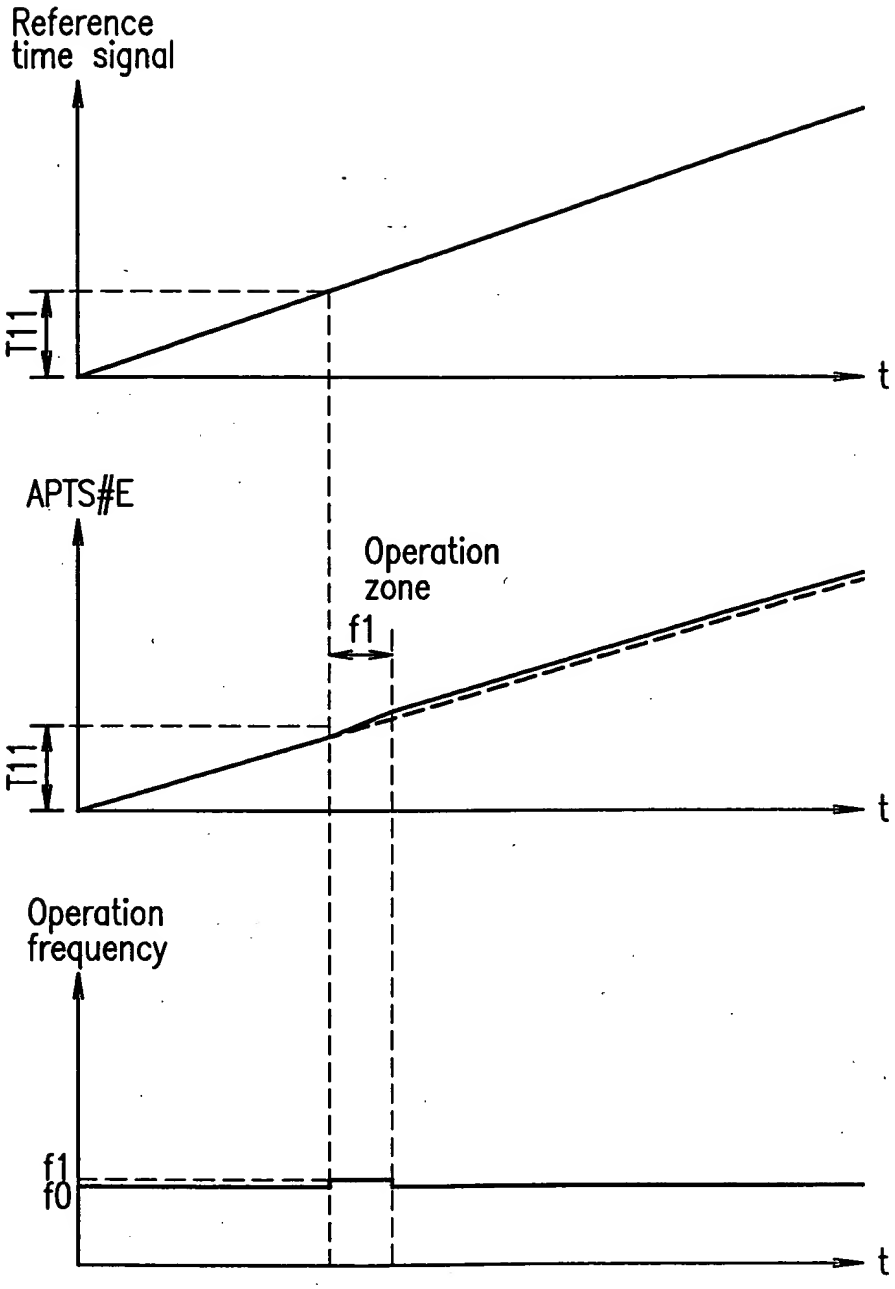
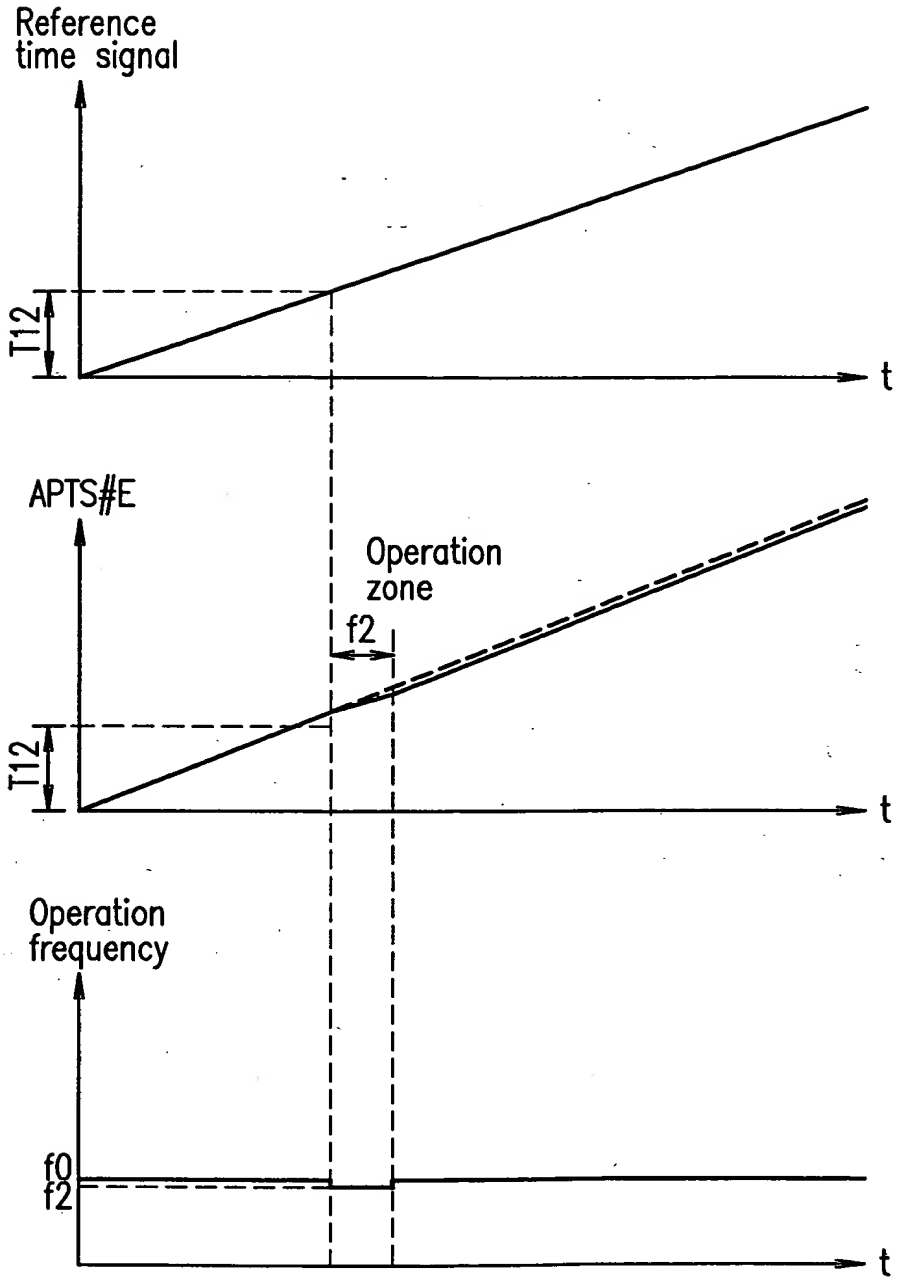

(a)
Reference time signal
T11
t
(b)
APTS#E
Operation zone
f1
T11
t
(c)
Operation frequency
f1
f0
t

FIG. 55


(a)
Reference time signal
T12
t
(b)
APTS#E
Operation zone
f2
T12
t
(c)
Operation frequency
f0
f2
t

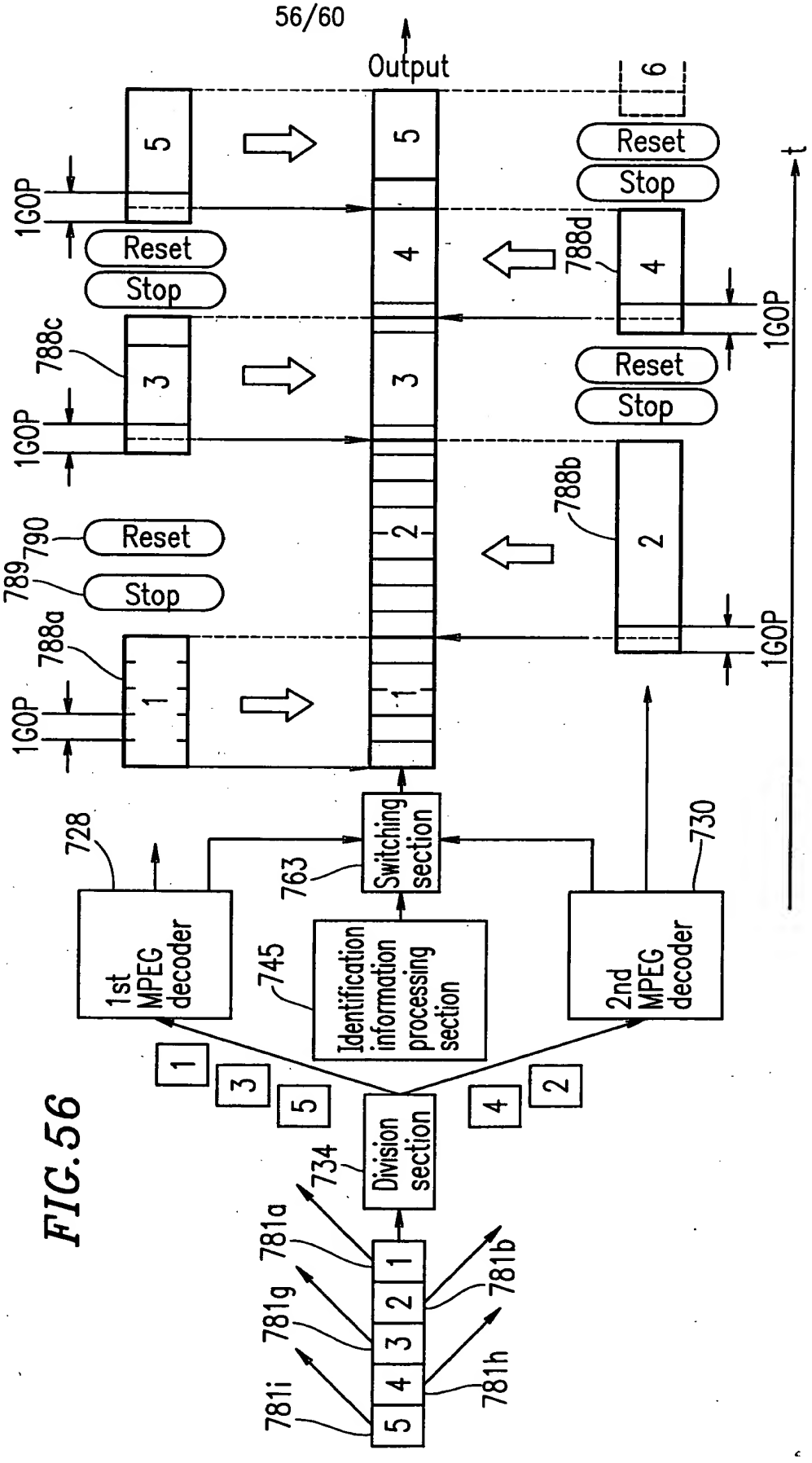
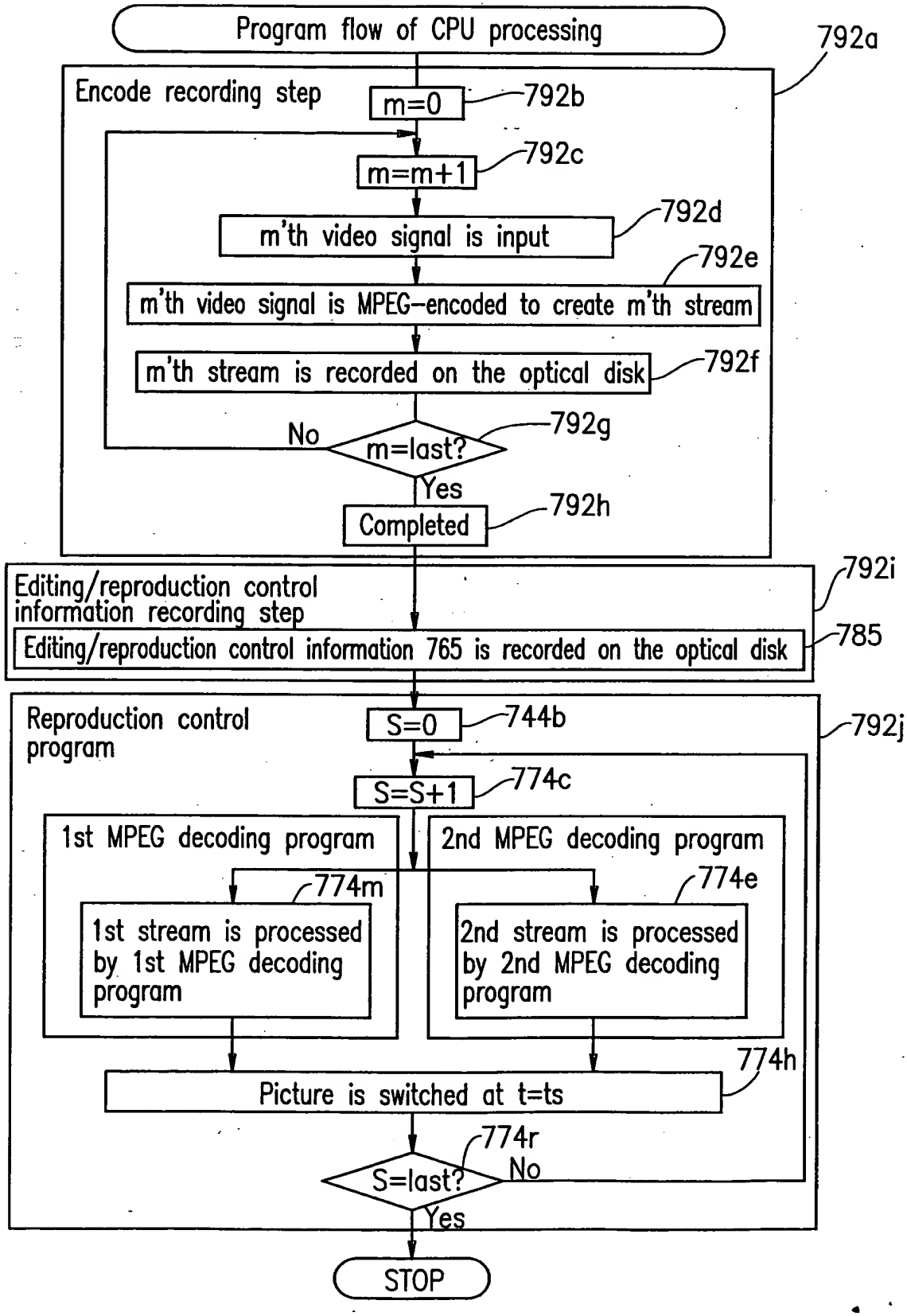

Output
t
1GOP
Reset
Stop
788a
788b
788c
788d
789
790
1st MPEG decoder
2nd MPEG decoder
Identification information processing section
Switching section
Division section
728
730
734
745
763
781a
781b
781g
781h
781i

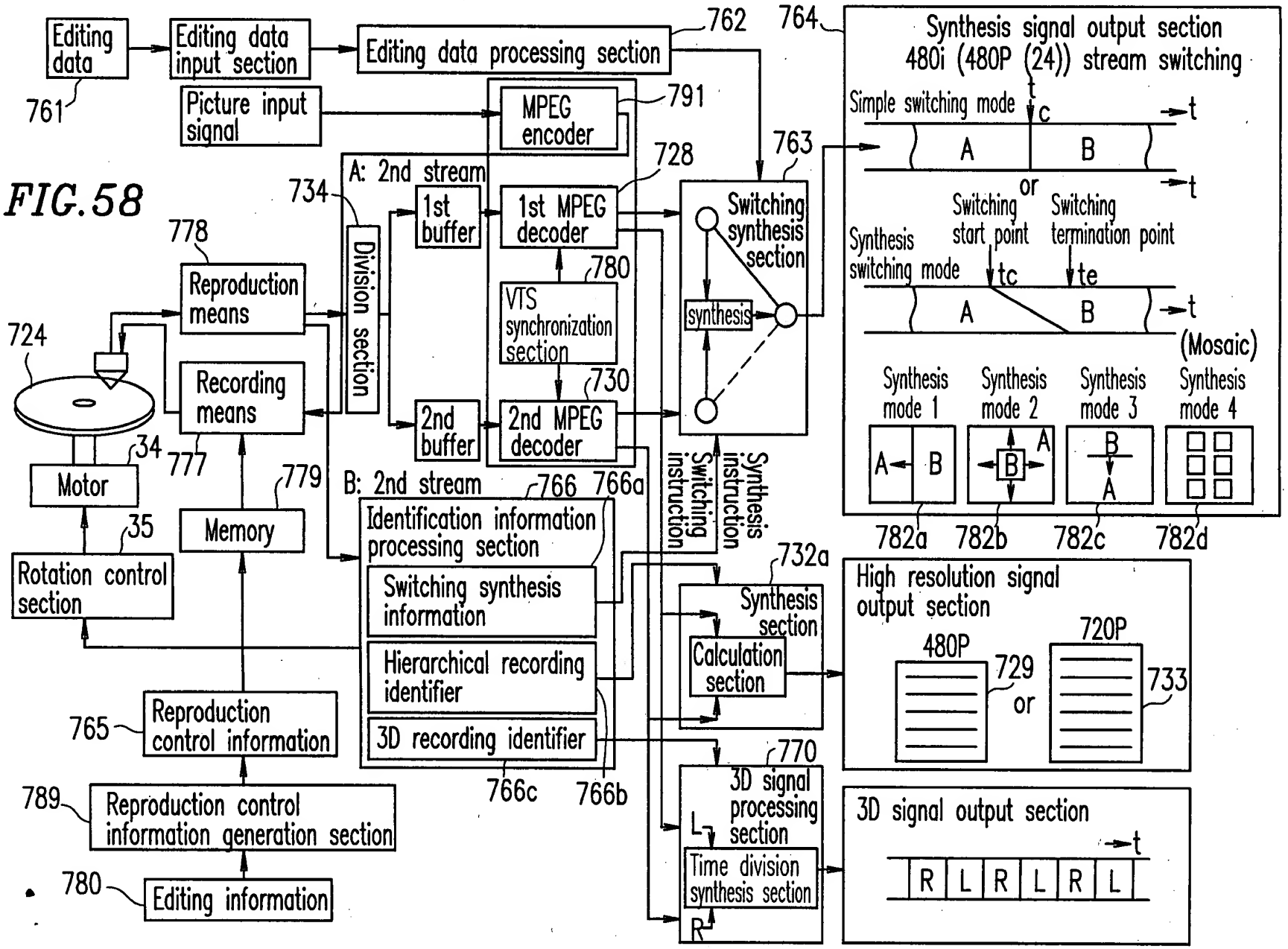
FIG.56

FIG. 57


Program flow of CPU processing
792a
Encode recording step
m=0
792b
m=m+1
792c
m'th video signal is input
792d
m'th video signal is MPEG-encoded to create m'th stream
792e
m'th stream is recorded on the optical disk
792f
No
m=last?
792g
Yes
Completed
792h
Editing/reproduction control information recording step
792i
Editing/reproduction control information 765 is recorded on the optical disk
785
Reproduction control program
792j
S=0
744b
S=S+1
774c
1st MPEG decoding program
2nd MPEG decoding program
774m
774e
1st stream is processed by 1st MPEG decoding program
2nd stream is processed by 2nd MPEG decoding program
774h
Picture is switched at t=ts
774r
S=last?
No
Yes
STOP

005090 8598460

FIG. 58



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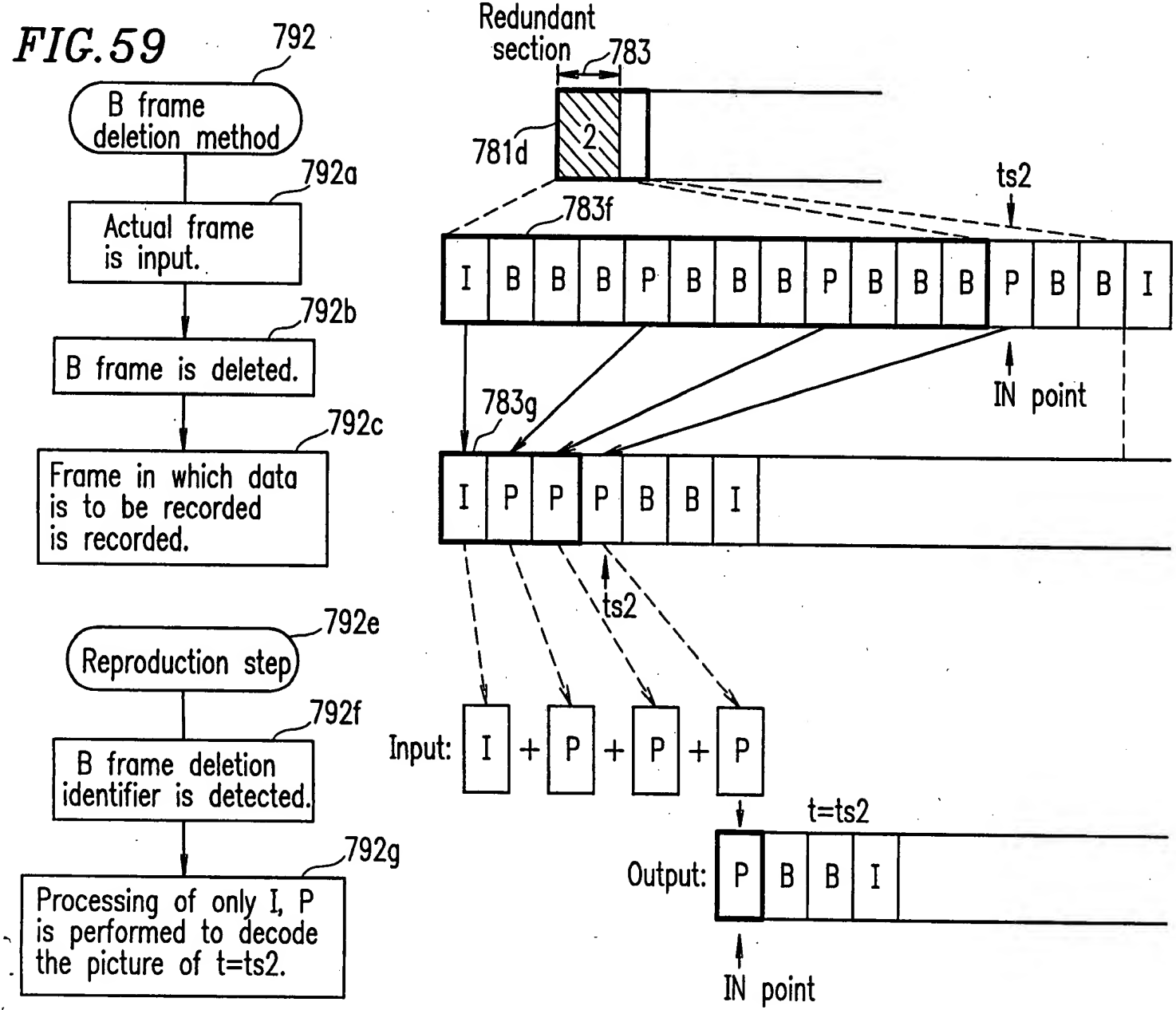
005090 "82598460

FIG. 59



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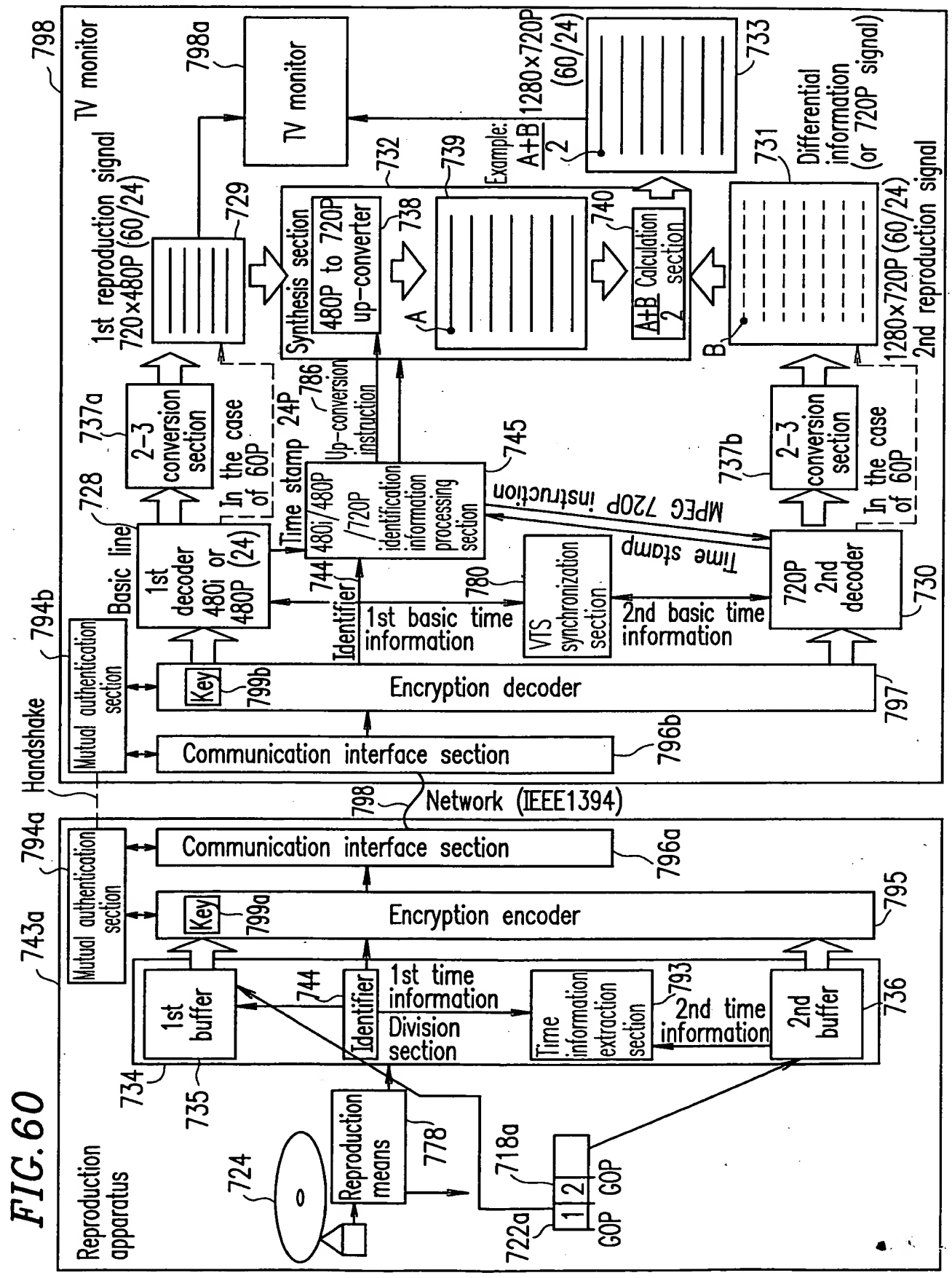
Reproduction apparatus
724
Reproduction means
778
718a
722a
GOP
734
735
1st buffer
744
Identifier
1st time information
Division section
Time information extraction section
793
2nd time information
2nd buffer
736
743a
Mutual authentication section
794a
Key
799a
Encryption encoder
795
Communication interface section
796a
Network (IEEE1394)
798
Handshake
Mutual authentication section
794b
Key
799b
Encryption decoder
797
Communication interface section
796b
Basic line
1st decoder 480i or 480P (24)
728
2-3 conversion section
737a
In the case of 60P
Time stamp 24P
480i/480P /720P identification information processing section
745
Identifier
1st basic time information
744
780
VTS synchronization section
2nd basic time information
720P 2nd decoder
730
Time stamp
MPEG 720P instruction
2-3 conversion section
737b
In the case of 60P
1st reproduction signal 720×480P (60/24)
729
Synthesis section
480P to 720P up-converter
732
738
A
739
Example: A+B/2
740
A+B/2 Calculation section
B
731
Differential information (or 720P signal)
1280×720P (60/24)
2nd reproduction signal
1280×720P (60/24)
733
798a
TV monitor
TV monitor
798
Up-conversion instruction
786

FIG. 60